TECHNOLOGY DEPT.

Gas Journal

VOL. 287. 108th YEAR. LONDON, SEPTEMBER 12, 1956. No. 4861. PRICE 1/6

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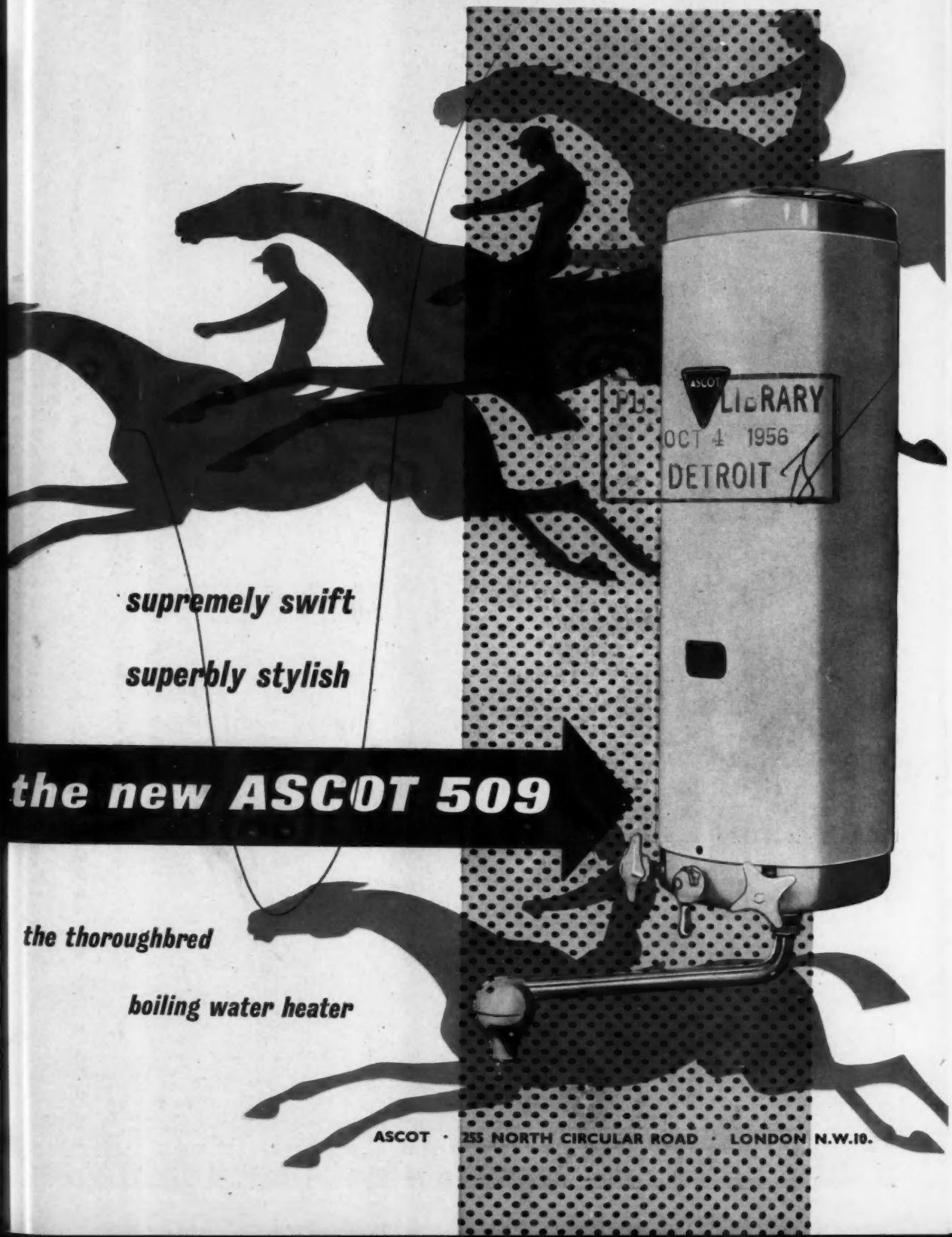

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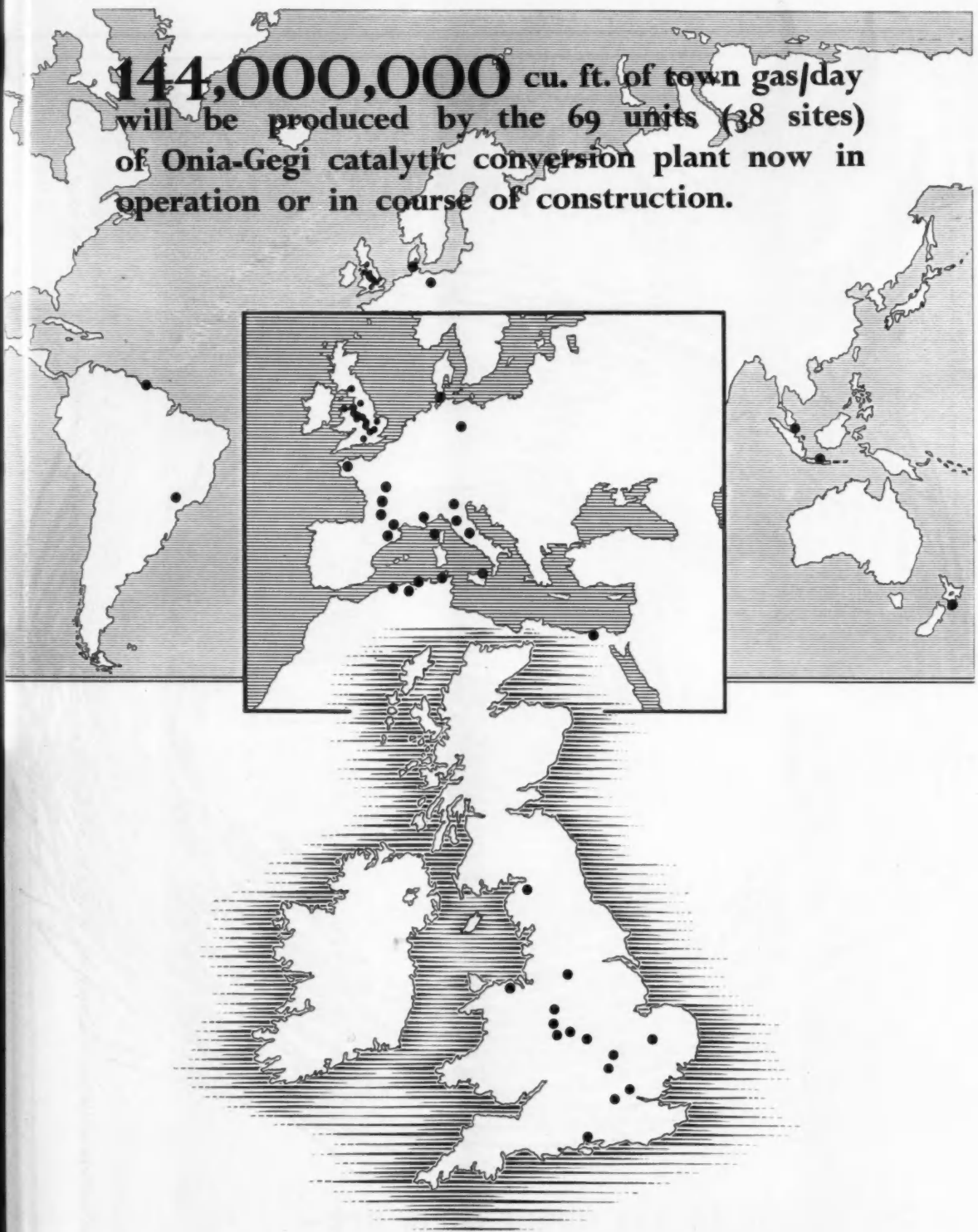

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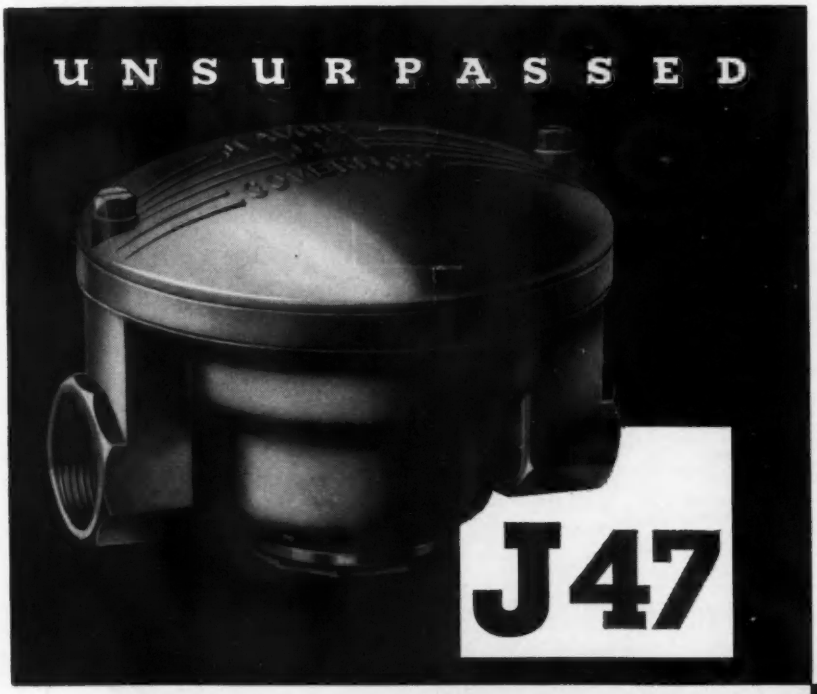

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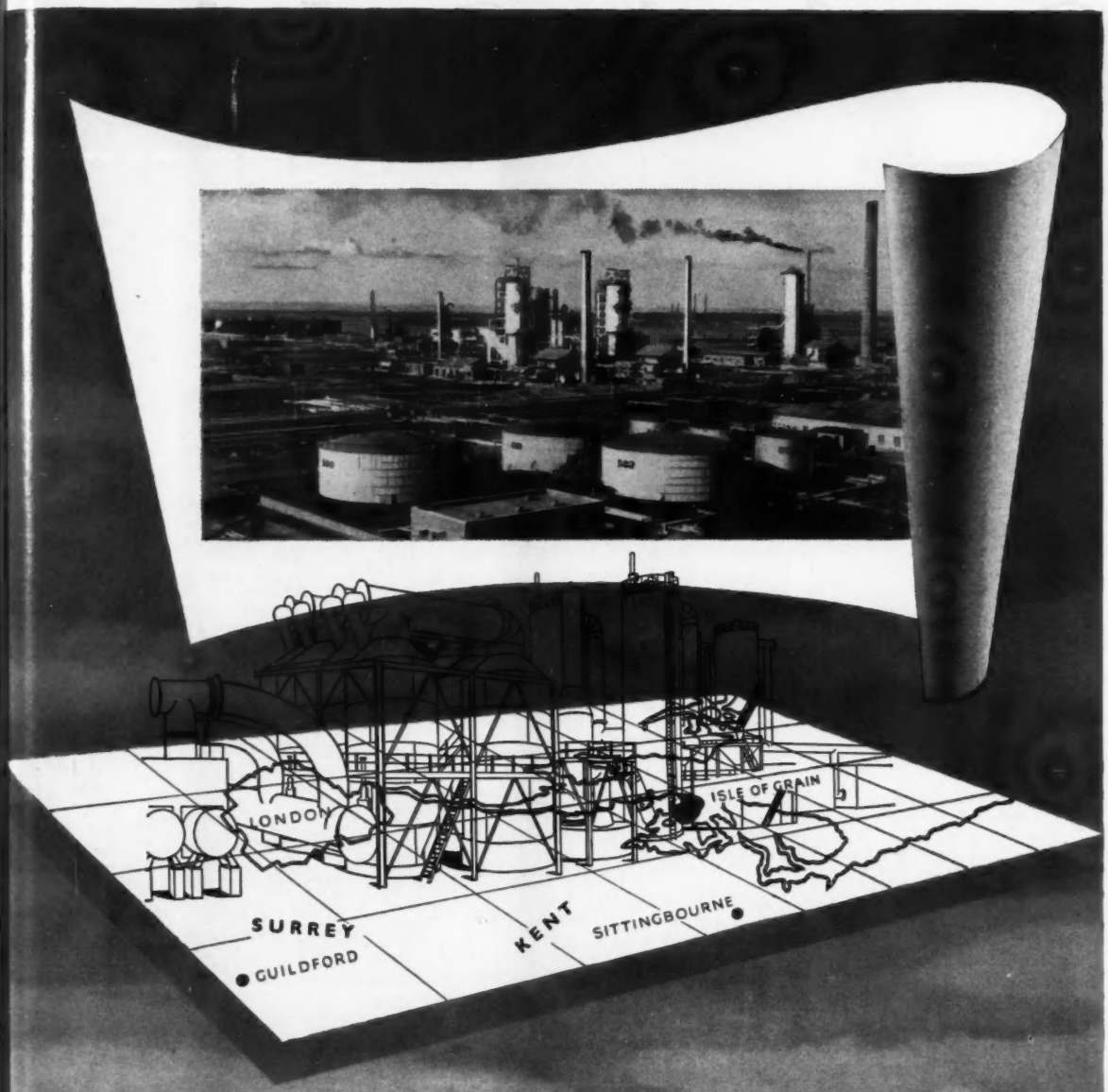

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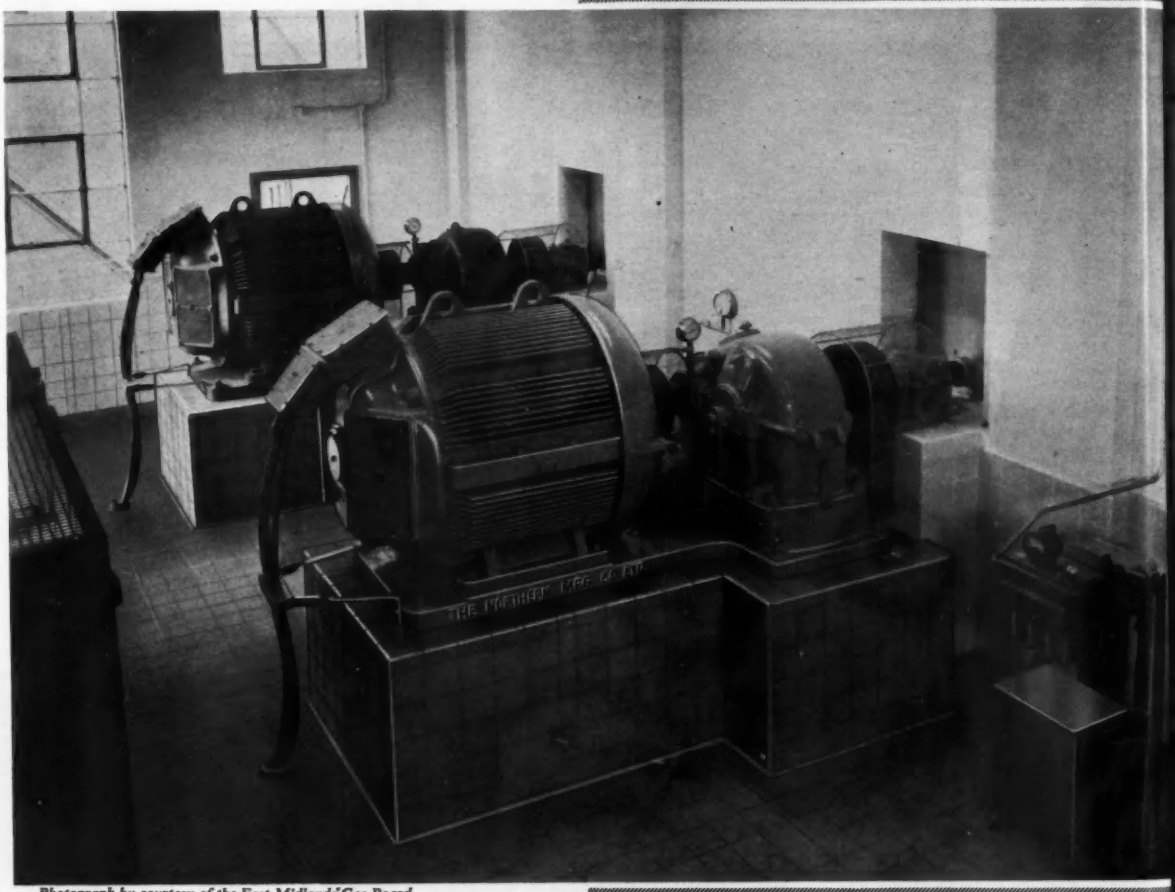

Photograph by courtesy of the East Midlands Gas Board.

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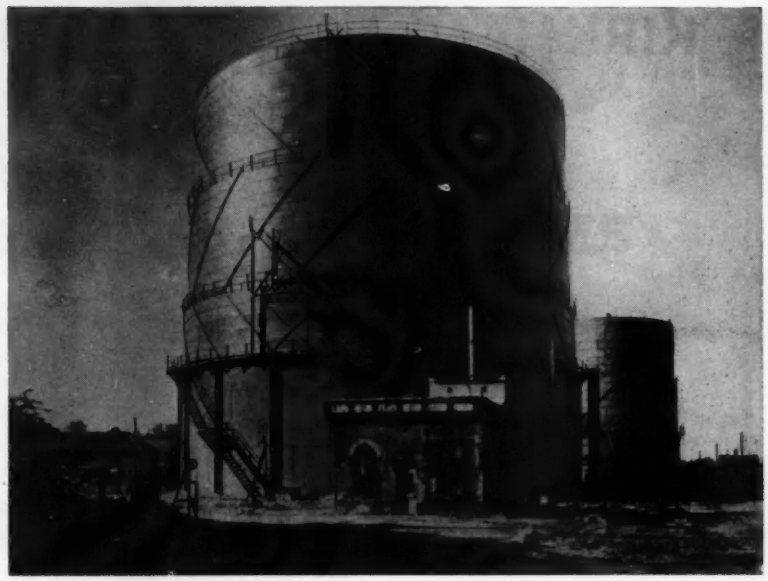

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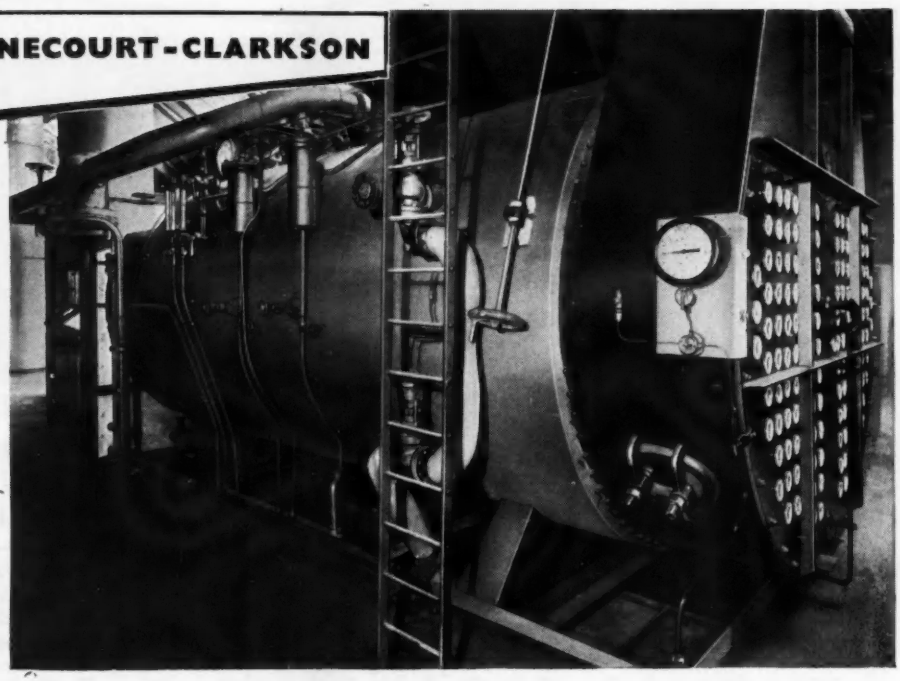

The illustration shows one of the Spencer-Bonecourt waste-heat boilers at Stoke-on-Trent Gas Works. Similar units are installed on all the Glover-West Continuous Vertical carbonising plant in this works.

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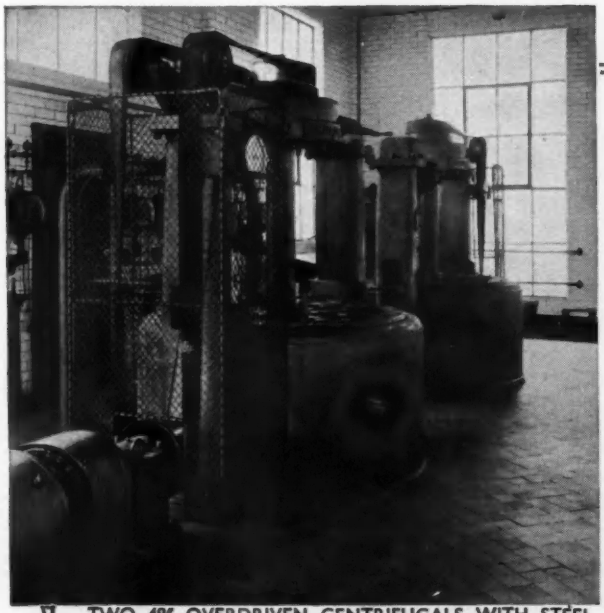

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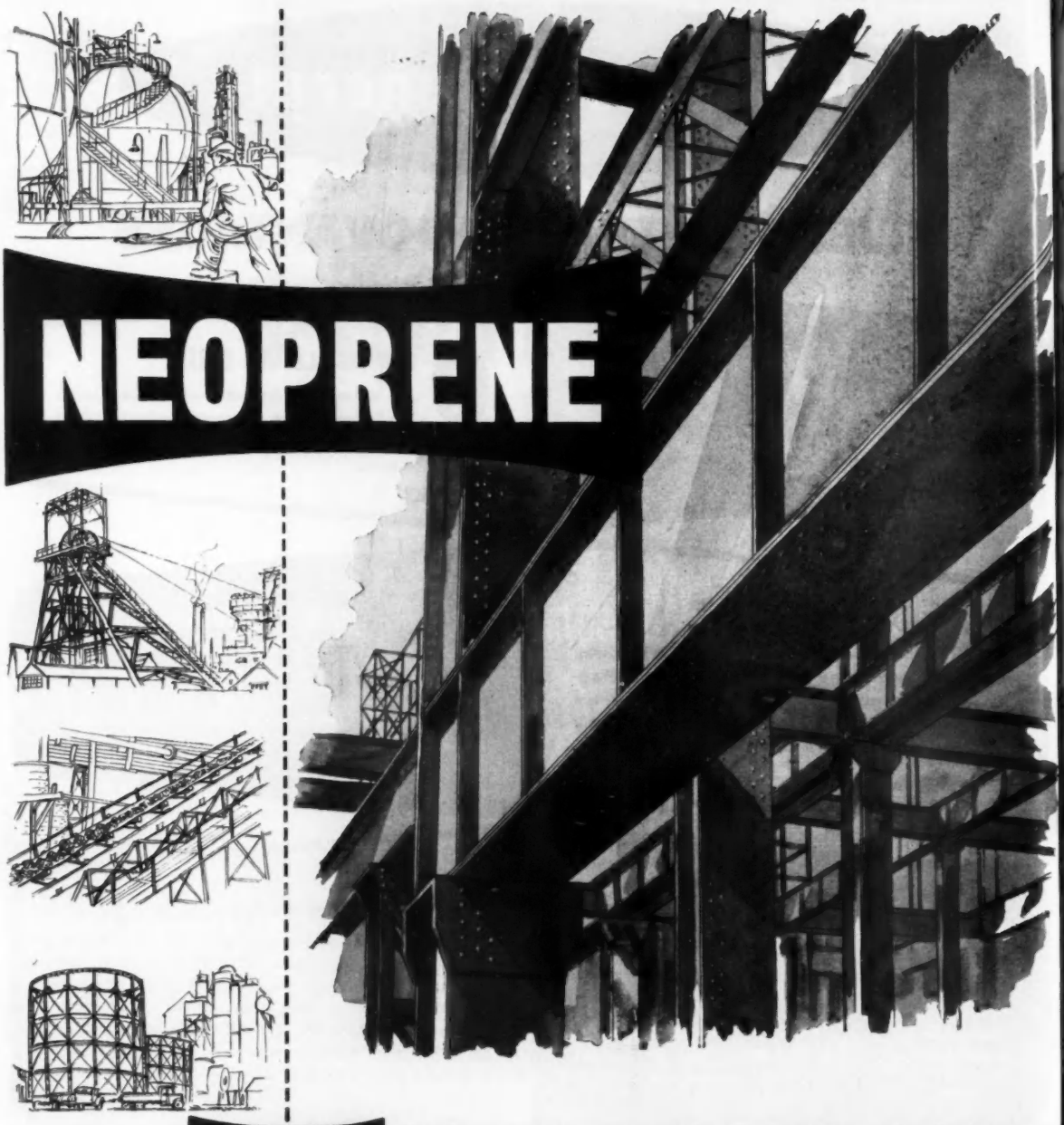

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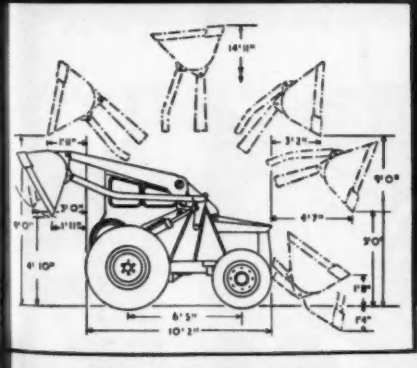

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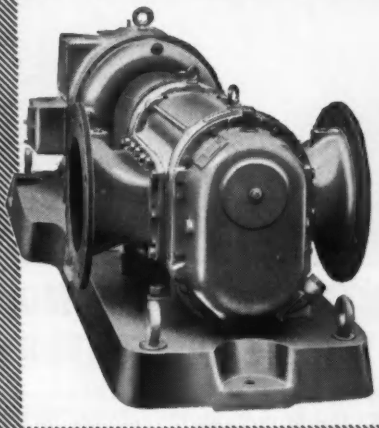

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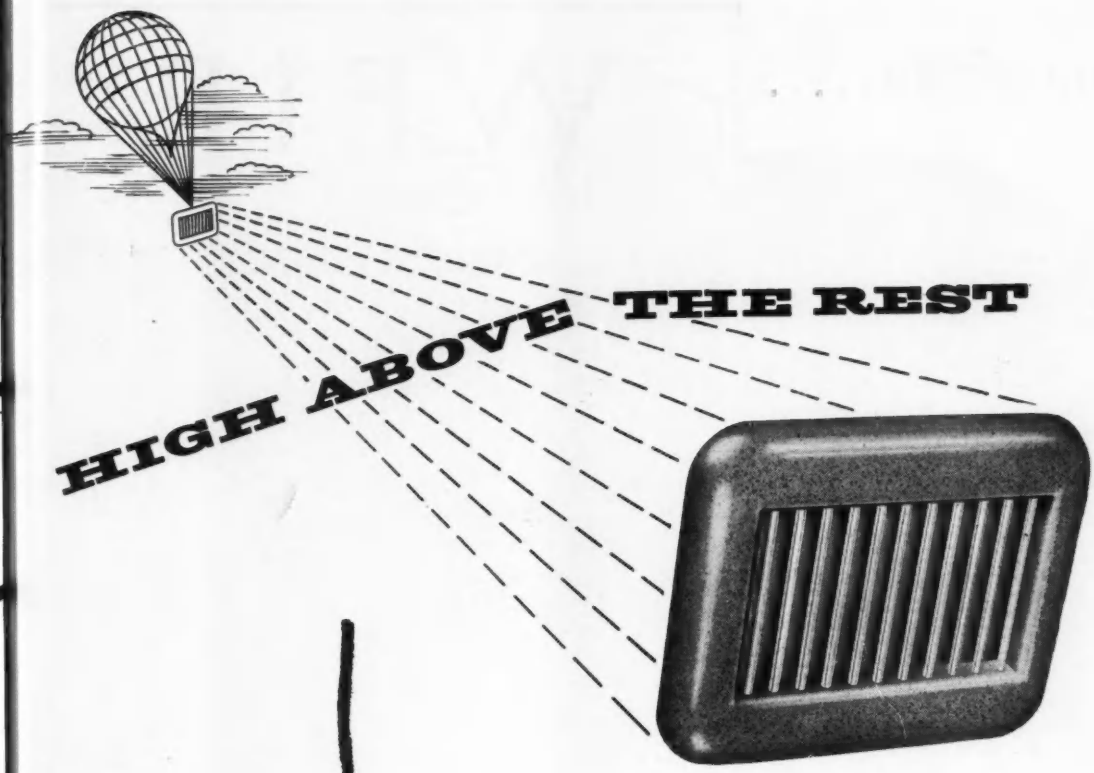

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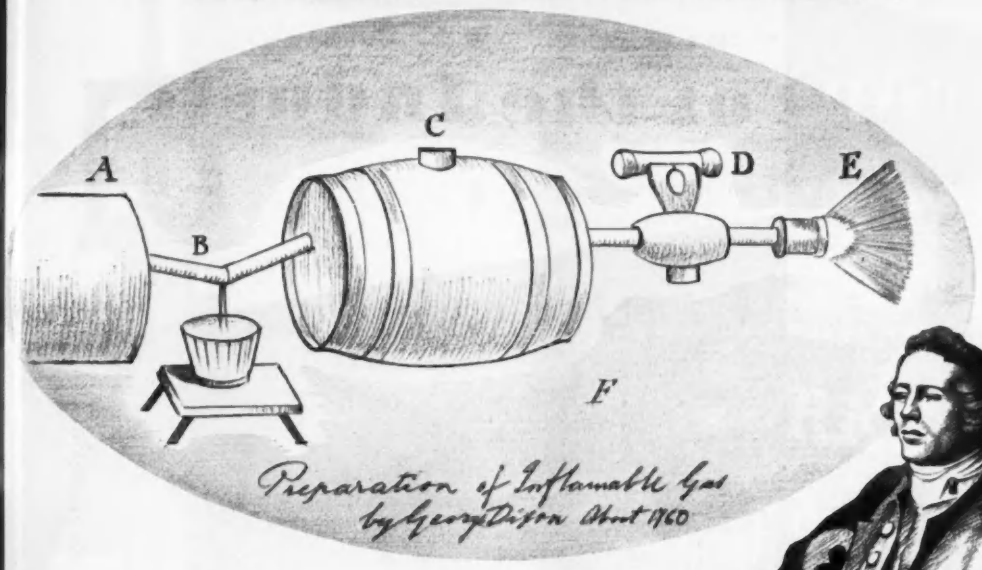

George Dixon
(1731 - 1785)

GEORGE DIXON was probably the first man to illuminate a room with a coal gas flame. He achieved this in 1779 with equipment consisting of a kettle filled with coal and a clay tobacco pipe sealed into the spout. The kettle was placed on an open fire and after a short time a candle was held to the end of the pipe. A contemporary writer states "immediately a bright flame issued from it where nothing was perceptible before".

Dixon experimented for a number of years with the idea of lighting his collieries but discontinued this work after an explosion "inside of the apparatus took fire as quickly as gunpowder, and exploded with a report like a cannon".

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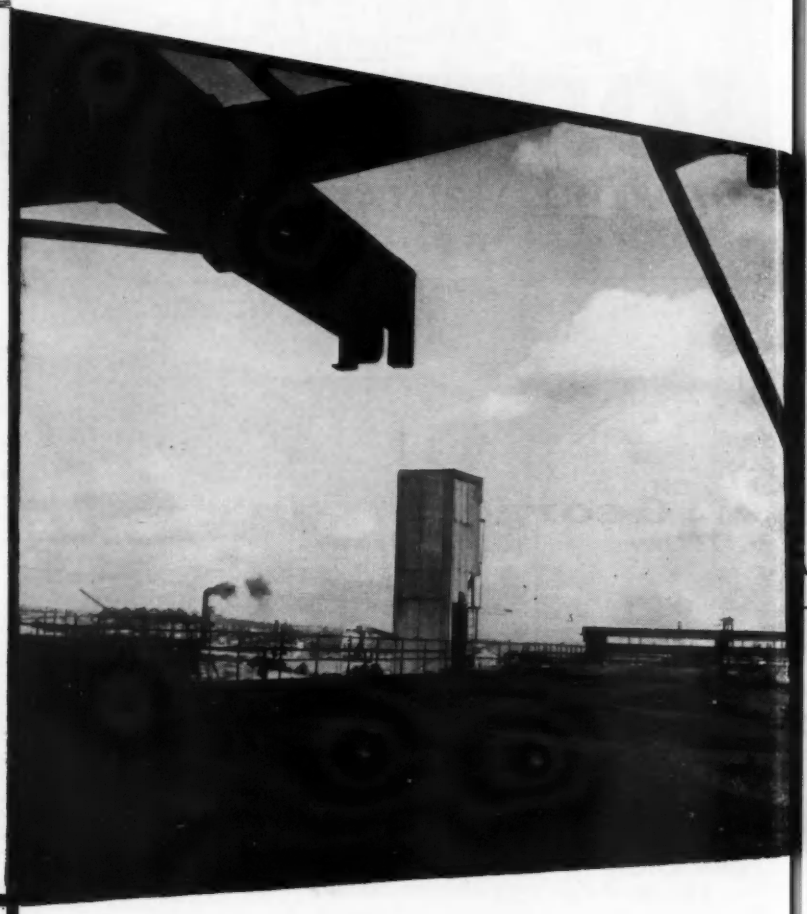

Such a view over the top of Tower Box Purifiers is doubly symbolic. It sugge the eminence reached by Balfour, but also represents an outlook above and beyon a vision unrestricted by what is past or merely current.

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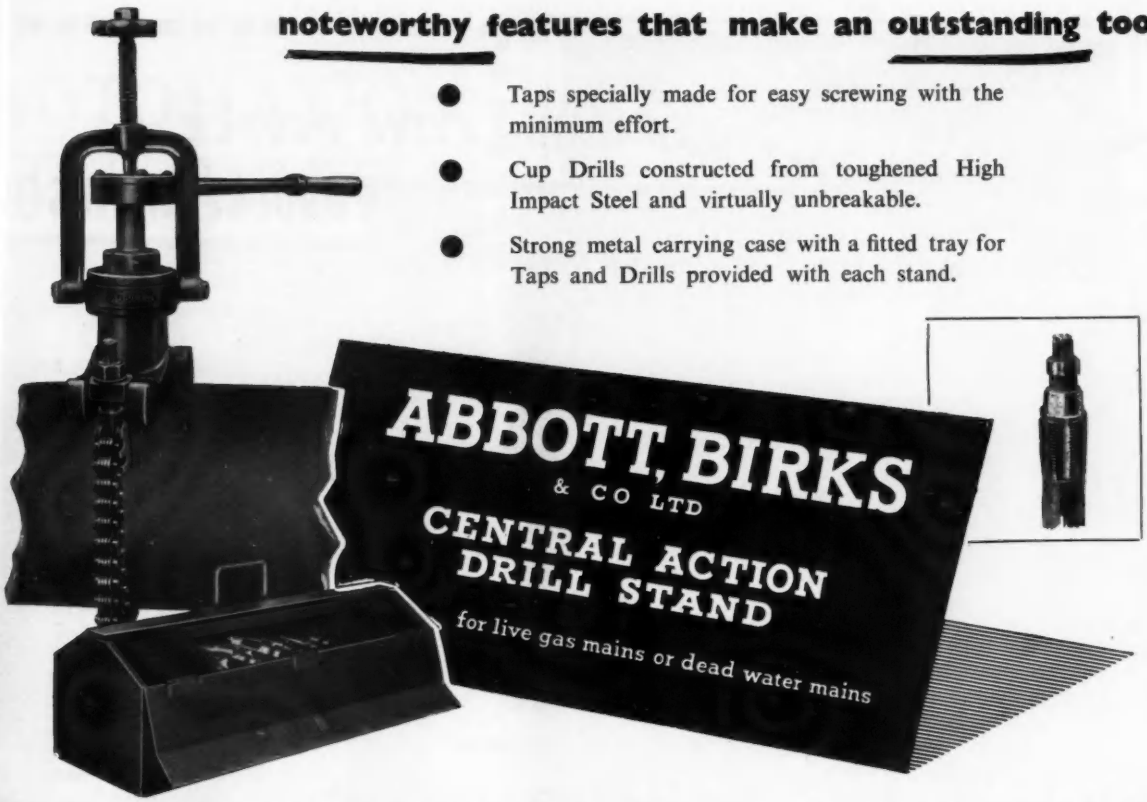

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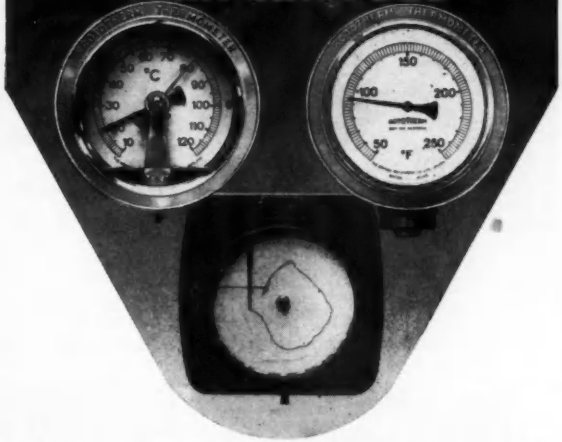

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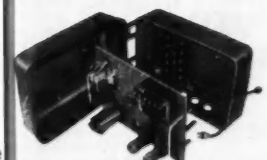

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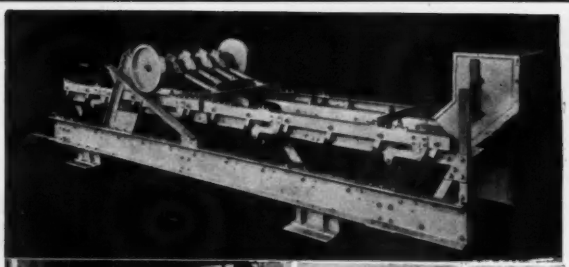

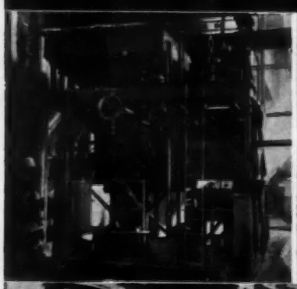

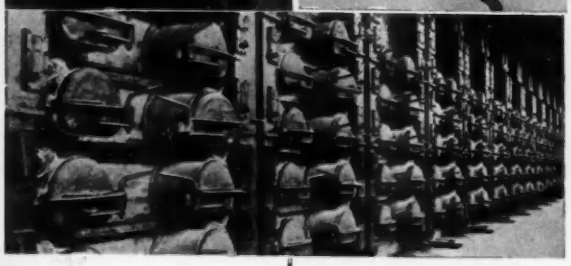

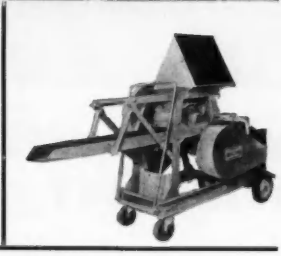

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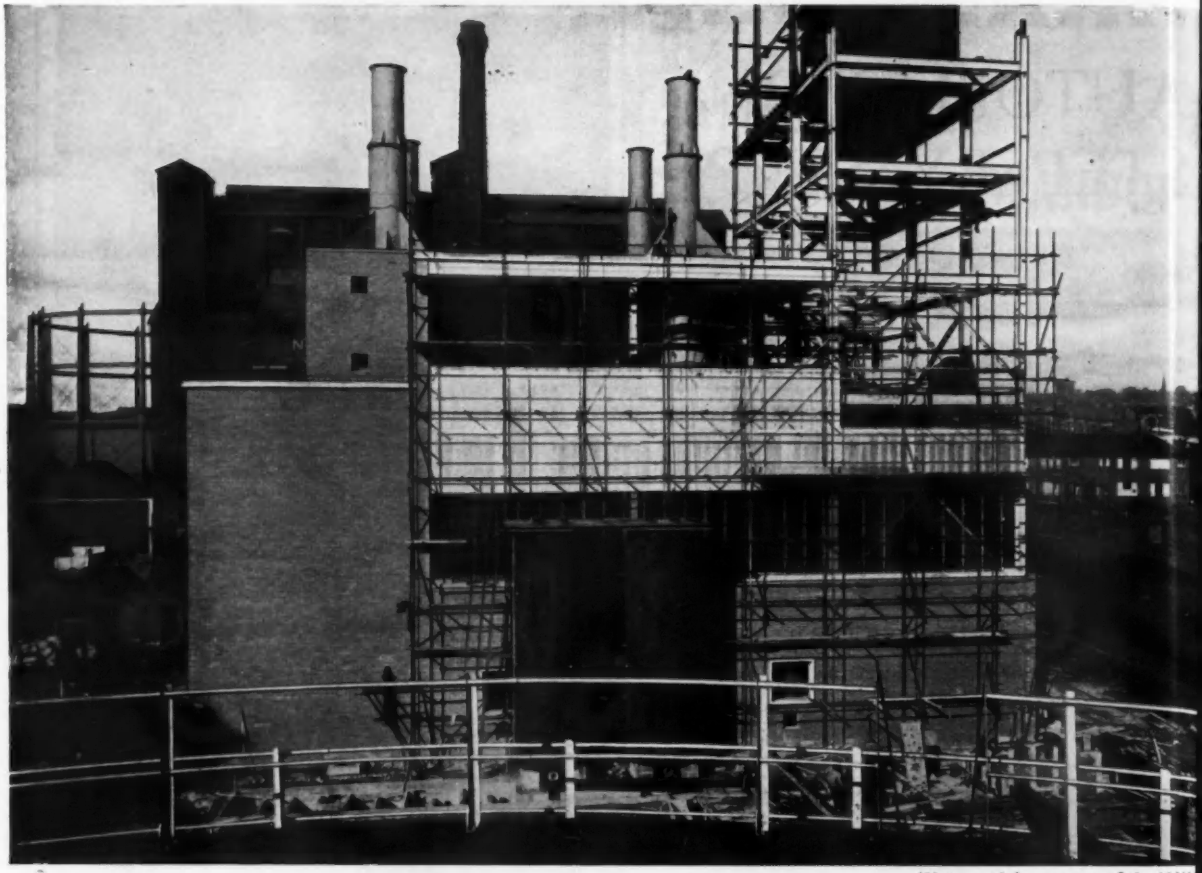

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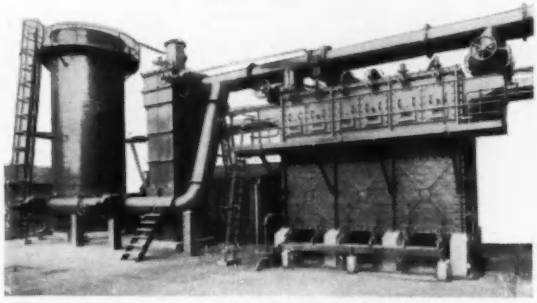
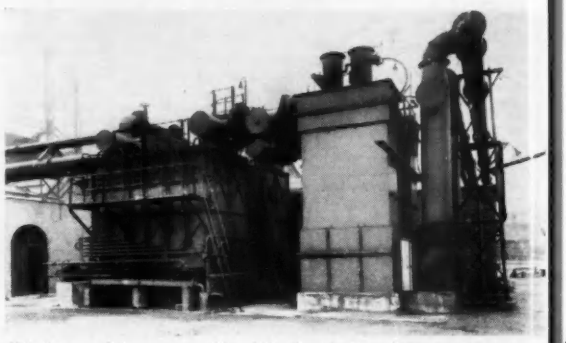
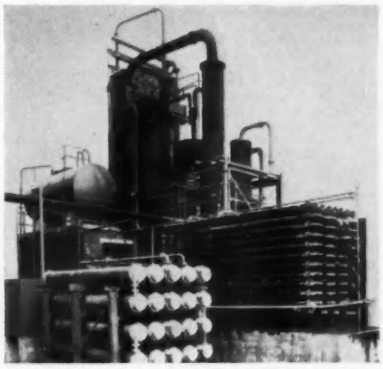


Wet purification plant comprising mild steel condenser, cast iron ammonia washer and plate-type electro-detarrer at Norwich for Eastern Gas Board.



Washers and detarrers at New Wortley for North Eastern Gas Board.



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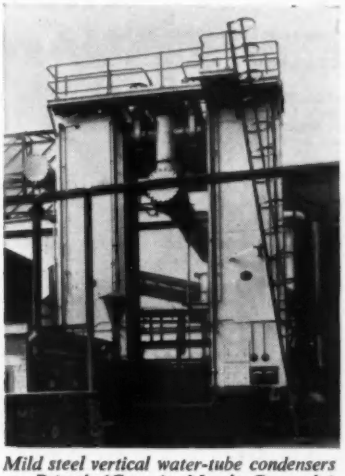
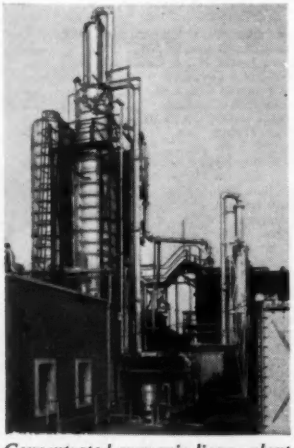
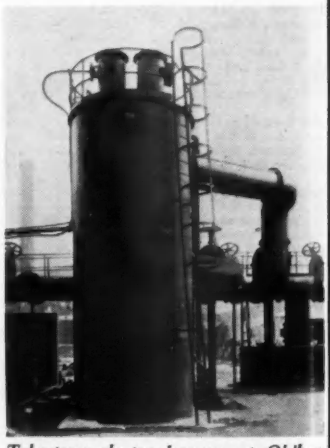


Mild steel vertical water-tube condensers at Bristol (Canon's Marsh Gasworks) for the South Western Gas Board.



Concentrated ammonia liquor plant at Bristol for South Western Gas Board.



Tube-type electro-detarrer at Oldham for North Western Gas Board.

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108TH YEAR

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VOLUME 287. No. 4861. SEPTEMBER 12, 1956. 108th YEAR

Control of Coal Supplies

AMONG thinking people in the fuel industries—and, for that matter, outside them—there is a feeling that all is not well with the way we are making use of our fuel resources. There is keen competition, and until lately there has been competitive advertising between gas, electricity, and solid fuel—much of it brilliantly carried out. Usually the best man has won, but the housewife has not infrequently been a little confused by the contradictory advice she has received from the local gas showroom, the electricity board's very able salesmen, and the well-devised advertisements of the solid fuel section of the industry in the national Press. It is always rather pleasing to see how well Mr. Therm acquits himself on these occasions, although the general public—including the housewife—sometimes ask awkward questions about the need for such advertising being, in particular, interested to know who, in the long run, foots the bill.

However, there is no doubt that the competitive spirit which it gives to the different sections of the fuel industry is excellent and should be encouraged as far as possible. The cost, too, is probably negligible when calculated in pence per therm—or in whatever fundamental form of gauging costs is used by the electricity and solid fuel industries—and it is well worth it for bringing the nationalised fuel industries well and truly before the public. This inter-industrial rivalry, however, though it may be good for a collection of human beings managing a giant industry, does not have such a good effect on the control and preservation of our none too plentiful fuel resources. These should be put to the very best possible use and it is interesting to see what Mr. W. F. Cummings says about it in his presidential address to the Scottish Western Junior Gas Association.

He points out that although atomic energy will shortly begin to contribute its share towards the power we need for our industries it will be some time before it really makes itself felt. Even now oil only accounts for something like 14% of our energy requirements which leaves coal as still by far the most important fuel in the country. The Ridley Report of 1952 showed that sufficient coal was not being mined in the United Kingdom to meet all demands though there had been a saving in domestic consumption of 10 to 12 mill. tons per year as a result of severe rationing during and after the war, though this had caused an increased demand for gas for domestic consumption and also for electricity. This dependency on coal makes it imperative that we use our coal resources in the most efficient way possible which implies the right kind of coal being reserved for the most suitable purpose.

We as an industry consider that coal is best utilised by converting it into gas and coke at an efficiency of conversion of something like 80%—rather than by using it for conversion to electrical energy or motive power by steam-raising at an efficiency of 20-30%—and burning the two fuels so formed more efficiently than the raw material. We must remember, though, that there are coals and coals. Some are excellent for steam raising and some for gasmaking. Mr. Cummings tries to stress this very point and in doing so asks for some control over the type of coal allocated to each and every purpose. In other words there must be a national co-ordination fuel policy, which will have to be carried out by some body whose interests in any one industry do not prejudice it towards another. Mr. Cummings thinks that the Ministry of Fuel and Power is the obvious choice. This Ministry should have all the three fuel industries equally at heart, and the power to act in whatever direction it thought necessary. For many the word 'control' has a somewhat sinister meaning and often has something politically menacing about it. But if a national fuel policy is to come into being—and it must do some day—control there will have to be.

For what is the good if an inferior household coal is all the gas industry can get while a first-rate coking or

gas coal is used by industry for steam raising or a merchant distributes it for domestic use just because the railway rates or some other factor makes it appear cheaper for this to be done? With the passing of the Clean Air Act a great many of these difficulties may solve themselves, as unsuitable fuels are likely to produce a good deal of smoke, and as soon as the producer of smoke realises how much money he is throwing away the sooner he will demand the fuel which gives him all the heat he needs without risk of smoke complaints. Mr. Cummings says on this point: 'As supplies of gas coal are dwindling, I find it rather disconcerting to read in the technical Press that during the committee stage of the Clean Air Bill, expert advice given to the Minister concerned admitted that certain types of mechanical stokers are liable to emit dark smoke if coking volatile coals are to be used. That it should be even contemplated in the first general Parliamentary action against the misuse of fuel, that coking coals should be allowed anywhere near industrial boilers. . . .'

Yes, gas coals must be kept as far as is possible for carbonising in gasworks, and strongly coking coals of suitable volatile content for manufacturing metallurgical coke (and gas as a by-product). Experiments are in progress for using some of the low rank coals for gasmaking, but without blending with some high rank swelling coal, the quality of the coke is liable to suffer and the gas yield will fall. This in turn will put up the price of gas. But what is the use of fundamental research and the perfection of new gasmaking techniques if it is possible for the proper grades of coal for such processes to become difficult to obtain, not because they are necessarily in short supply but because they are being consigned to the wrong customers?

Street Lighting Load

THE Association of Public Lighting Engineers are due to meet in Blackpool on September 18. It is doubtful how interested gas engineers are in such a gathering nowadays.

At one time, in the smaller undertakings at any rate, the street lighting load was jealously guarded as a cheap form of advertising which enabled the general public to see gas light in action and to congratulate themselves that even in small villages, if they boasted a gasworks, their streets were properly lit. In those days—30 or 40 years ago—traffic was not very heavy in country districts and the friendly gas lamp was there for the good of the villagers and not for the benefit of the motorist who might be passing through late at night. If anything, he would have found the gas lamp more of a nuisance than a help, as it had a habit of throwing shadows which could be very confusing and, so far from preventing accidents, would make them all the easier.

As can be easily imagined, each lamp could not be fitted with a meter to measure the gas being consumed so that fixed prices were charged for the number of hours they were burning. There might have been a small loss but that would be borne for the sake of the advertising value.

After the last war, however, things had changed, costs increased all round, labour was more expensive and the cost of maintaining lamps had increased—not to mention the cost of manufacturing the gas. The small or medium-sized undertakings still thought it wanted the load and were prepared to quote a low price to secure the contract, but as this included the maintenance, cleaning, etc., of the lantern, it became impossibly expensive. By the time nationalisation had become an accomplished fact, these undertakings had come to the conclusion that the street lighting load was not really worth the trouble. Unfortunately, however, getting rid of a load takes time.

The gas industry decided, therefore, to wash its hands of all maintenance and merely supply the gas. Automatic devices had been used for a number of years to light and extinguish the street lamps, though the lamplighter, that romantic figure, has always remained in London. In London, however, the type of man who takes on such a job is not the type you would expect. The newest recruits to this curious profession, we understand, are artists from the basements of Chelsea and elsewhere, who are very glad of a steady few pounds a week to keep them going between the selling of a masterpiece or in the hard school of training. But the number of gas lights is fast decreasing, so that it seemed symptomatic when glancing through the papers to be read to the A.P.L.E. that there was only one gas lantern illustrated—a refractor panel gas lantern by Sugg.

Perhaps the first thing to threaten the existence of gas lighting, apart from the spread of electricity throughout the country in the 1920's, was the first British Standard for street lighting in 1927. This involved the specification of a test point and certain minimum illumination values. This specification had a great effect on lantern design and it encouraged highly directional reflectors.

With the introduction of the high-powered mercury discharge lamp of 250 to 400 watts in 1932, a real illumination became a possibility as opposed to a light in the darkness. Gas lamps with a multiplicity of mantles had been introduced and even high pressure gas lamps which did much to combat the electrical competition but the battle seemed to be really lost for gas in the bigger towns. With the introduction of the sodium lantern and a new specification sponsored by the Ministry of Transport in 1937, new standards for lighting had been set, but it was not till after the war when the blackout was a thing of the past that it could be really developed. The sodium light, which suffers from the fact that it is monochromatic and therefore has such an unpleasant effect on other people's appearance, is undoubtedly one of the best means of lighting streets and main roads passing through towns. With well-designed lanterns, there need be no glare, very little shadow and adequate illumination at a low consumption of electricity. Strip lighting and other modern means are now being installed in the larger towns and, in fact, as one of the papers to be read at the conference suggests, it is now merely a matter of cost and what the local councils are prepared to pay for the quality of illumination required for the locality in question.

Has gas been ousted from street lighting? Gas lighting in any form was really given up years ago, but it may be retained by houses without electric wiring or by householders who might think it cheaper. We prefer to think that gas has grown out of this particular stage to go forward to greater things—in heat production, especially—where it reigns supreme.

After the T.U.C.

MR. Macmillan certainly 'had his answer' when the Trades Union Congress bluntly told him—if not in so many words—that they would co-operate only on certain conditions. That these conditions can hardly be met by the Chancellor is fairly obvious. They would be a complete reversal of his present policy. But what the unions demand is in fact a controlled economy—control of prices, profits and dividends. Then, and only then, will wage restraint be exercised. One resolution attacked discrimination against the nationalised industries which, the resolution said, are 'being used as a drag-anchor.' It was maintained that they were the only part of the economy which the Chancellor could manipulate with any firmness. On another point the unions are adamant. Wherever unemployment comes about, for whatever reason, the Government should try to create alternative employment for the displaced workers and supervise the re-training and re-location of such people.

So it appears that economic war has been declared. The word is used advisedly. It has been bandied about since the beginning of the T.U.C. conference, which quickly unified itself under the militant banner displayed by, among others, Mr. Frank Cousins of the Transport and General Workers' Union.

So far as any industrial organ is able—especially one that deals with a nationalised industry—the 'GAS JOURNAL' refrains from outright comment on partisan political issues. But comment is certainly called for on the assertion that State industries are being used as an economic 'drag-anchor.'

Perhaps the unions are right; the Chancellor's idea, as we understood it, was that these essential industries should set the pace in price-holding by swallowing their costs for a while. Of course, capital expenditure would naturally have to be severely restricted, but was it not worth it in an all-out effort to fight inflation?

However, now that wage restraint has been abandoned—which seems to augur an industrial free for all—is there any point in holding down capital expenditure by the key industries? Where is the logic in calling some hounds to heel, while the rest are out on the rampage?

Il-y-avait une fois . . .

THIS week sees the last of a series of articles in the 'JOURNAL' highlighting the development of the gas industry in France. No doubt about it, the industry has been making great progress. We have been happy to be able to record it. And it makes pleasant reading when compared with some of the harsh things we were saying in these columns about gas in France a century ago.

For the current articles on our French colleagues prompted us to turn back the pages of history. And on the very first page we opened in the old bound volume of the 'JOURNAL OF GAS LIGHTING' for 1856 was an editorial under the derisive heading 'More Parisian Gas Bubbles'! The moral of the story was that a number of new gas undertakings had been floated in France and their shares pushed on that arch 'bubble-generating medium,' the Paris Bourse.

One of these 'bubbles' was the new gas company, in Paris, *L'Alliance*, which had been formed to take over a small gasworks to light the Hôtel des Invalides. We were evidently happy to be able to report that it had run into difficulties from the outset because the gas produced by this particular works had been condemned as injurious to health, and its further production banned.

We were also clearly delighted to learn that an associated company, *L'Union des Gaz*, had fallen down over its undertaking to light the towns of Toulouse and Sens owing to the failure of its plans to produce gas by heating the retorts with waste heat from coke ovens—they certainly had some go-ahead ideas in those days, even if they couldn't make them work! We had, incidentally, likened these two companies, which had amalgamated, to 'bubbles rising through saponaceous fluid and merging to form a larger bubble.'

But the 'monster bubble' of our leader writers of those days was the *Cie. Générale des Compteurs à Gaz* which claimed to have perfected a new fool-proof, tamper-proof, rot-proof and altogether perfect gas meter. We exulted in pointing out that this invention was nothing more than the infringement of a British patent of some years earlier which had been tried in this country and scrapped as worthless!

Going back to *L'Alliance*, our biggest hate seems to have been the plans worked out by this concern to overcome its difficulties at the Invalides by manufacturing water gas—no, not the carburetted variety: Gas produced by the decomposition of water by electrolysis. This process, claimed *L'Alliance*, would cost virtually nothing, the whole business depending on the 'mere turning of a wheel.' They certainly managed to 'sell' the idea in Paris, and even got the Emperor and Empress of France interested! And, indeed, the project must have sounded like a real money spinner. For, apart from the fact that electric water gas—or platinum gas as it was also called—was to cost nothing to produce, the company had dreamed up plans for one or two highly lucrative sidelines. Their plant was to be at the disposal—at a fee, of course—of all the electro-platers in Paris, and the extraction of minerals from ores was also to be undertaken. For this venture we forecast certain disaster.

And, thumbing through the old 'JOURNAL' pages, we find that we were vindicated only a few months later. Far from costing nothing to produce, water gas had been found to be several hundred times more expensive to make than coal gas. It had further been pronounced explosive, poisonous, and undesirable in every way (though it must be recorded that at Le Havre, where it was actually being supplied to consumers, it gave a more brilliant light than coal gas!). However, what went on at Le Havre did not help *L'Alliance* and we rejoiced in recording its downfall.

But there, that was 100 years ago—half a century or so before the 'Gay King' fathered the Entente Cordiale, and at a time when British sensitivities were probably still smarting under some of the rude things Napoleon had said about us half a century or so earlier. No doubt, too, there were some equally funny ideas flying about in the gas industry over here in those days. Things are very different now both here and, as our readers who have been following the articles on gas in France will have noted, over there. As we said, we have been happy to be able to record France's achievements—*bravo, chers colléges, nous vous saluons!*

INDUSTRIAL GAS BIBLIOGRAPHY

A bibliography dealing with 'The Industrial Utilisation of Gas' has been compiled by Mr. G. H. Wright, A.L.A., Technical Librarian, Hertfordshire County Council. This is in fact No. 8 in the special subject list issued by the Library Association (Chaucer House, Malet Place, London, W.C.1) and was originally compiled for an exhibition on the subject held during March of this year at Westminster Technical College.

Personal

SIR PETER ROBERTS, M.P., who is to be the next Master Cutler, is Chairman of Newton Chambers and Co., Ltd., Thorncliffe, near Sheffield, and also Chairman of Wellman Smith Owen Engineering Corporation, Ltd., Darlaston, Staffs., in which company Newton Chambers have a large interest. His family has been associated with industry in the Sheffield district for more than 300 years and he is a direct descendant of Robert Sorsby, first Master of the Company of Cutlers in Hallamshire created by special Act of Parliament in 1624. It was in December, 1954, that he became Chairman of Newton Chambers in succession to his father, the late Sir Samuel Roberts.

The Queen has sanctioned the appointment of MR. W. O. KIRKWOOD, General Manager, Sunderland Division of the Northern Gas Board, to the Most Venerable Order of St. John of Jerusalem. Mr. Kirkwood, who is President of the Sunderland Centre of the St. John Ambulance Association, was Chairman of the North of England Section of Gas Engineers in 1951.

MR. J. C. COTTERILL has been appointed Engineer and Manager of the Wales Gas Board Abercarn undertaking, where he took up his duties on September 1. For the past three years he has been District Engineer and Manager, Stroud District, South Western Gas Board, and previously held the position of Manager to the St. Austell Group for 17 years.

MR. F. J. MOORE, who has been on the staff of the Taunton Gas Company and South Western Gas Board for 37 years, has been appointed showrooms and sales development supervisor at Plymouth.

LORD REITH was appointed a Director of the British Oxygen Co., Ltd., at a Board Meeting held on September 5.

Obituary

MR. THOMAS ALFRED DAVENPORT died suddenly early this month. Mr. Davenport joined the drawing office staff of West's Gas Improvement Company in January, 1920, and the following year was appointed Clerk of Works on the erection of carbonising plant at Coventry. He remained on the outdoor staff of the Company, working mainly from their London Office until October, 1927, when he left them to take up a technical position with the Leicester Corporation Gas Department. He returned to the staff of West's Gas Improvement Company in 1936 and in 1946 he set up their Midland (Birmingham) office. Mr. Davenport was elected a Member of the Institution of Gas Engineers in 1938. He leaves a widow and three sons.

Correspondence

MYSTERY OF THE PIPELESS GAS VALVE

SIR,

Your article, under the above heading in the current issue of the 'GAS JOURNAL,' illustrates precisely the same piece of apparatus as was in my possession for some years.

The apparatus, with which I am familiar, was used in a church, built in 1878, and was positioned in the seat of the Chief Steward, who thus had control over the amount of gas passing to the flat flame burners, which were used for general illumination.

It has always been assumed that the dial was calibrated in the way shown in order to avoid such a casualty as the complete extinguishing of the lights during the sermon, when it was intended only that they should be somewhat reduced in strength, in order to make the illumination more congenial.

The main valve controlled by the apparatus was positioned 6 ft. below the floor, and connected by the weight-balanced chain, as explained in your article.

Yours faithfully,
T. H. PRATER.

Engineer.
South Eastern Gas Board,
Margate.

September 6, 1956.

SIR,

In the 'GAS JOURNAL' of September 5 (p. 557) you illustrate and describe an apparatus made by Carnaby & Co., of Liverpool, and you ask the purpose for which this was designed.

I well remember a somewhat similar apparatus fitted in my father's house some 50 years ago; there it was used to shut off the consumer's control cock on the ground floor of the house from a position on the first floor. The cock had a ¼ in. iron bypass around it with a brass tap in it so that when the main cock was turned off sufficient gas could pass around the bypass to keep an adequate gas supply for the pilot ignition of gas lights.

The idea unquestionably was to lessen the possibility of an accident arising through fire or a leak during night hours. By having the apparatus on the first floor the householder could proceed to bed with the advantage of his gas lights, and could turn off his principal gas supply at the last moment.

Perhaps I should add that the apparatus that I am quoting was not embellished with a dial and a polished wooden case, and it had been fixed up by my grandfather. He was a gas engineer and I have no doubt that he made his apparatus himself.

Yours faithfully,
D. L. COPP.

Distributing Engineer,
North Thames Gas Board,
Westminster.

September 7, 1956.

NATIONAL FUEL POLICY

SIR,

I notice in your issue dated August 22 that your editorial quotes a letter of mine which appeared in an earlier issue of the *Electrical Review*. May I have the opportunity of entirely disclaiming the inference you have drawn from my remarks? A monopoly of electricity supply for domestic use was neither intended nor implied and, as a regular reader of the 'GAS JOURNAL,' I recognise the value of gas as a fuel.

I do suggest, however, that several sources of fuel laid to every house in the country is an unnecessary and wasteful luxury. You are kind enough to agree that for light and power electricity is pre-eminent and since we must therefore lay a supply to every home, surely full use should be made of that distribution network before laying on another source of fuel. However, I dislike monopolies equally as much as unnecessary competition and suggest that one other source of fuel to each household would meet most needs.

Personally, my alternative source would have to be based on purely economic consideration and, although some of my colleagues might not agree, I am satisfied that for continuous heating purposes solid fuel is the cheapest, followed by oil, with gas bringing up the rear. If we have to rely on coke as the principal smokeless solid fuel we necessarily make gas and in order to conserve all our fuel, provision must be made for its use.

I suggest it is not beyond the wit of man to devise schemes whereby one of the alternatives of solid fuel, oil or gas could be supplied to districts most suited to them. Surely a national fuel policy should have some such idea in mind for the future, to ensure not only an unpolluted atmosphere, but conservation of our fast disappearing fuel reserves. Life would be far more interesting if we could halve the fuel bill and use the surplus cash to enjoy our leisure moments.

Yours faithfully,
F. L. WARING, A.M.I.E.E.

52, Horsham Road,
Bexleyheath,
Kent.

September 10, 1956.

Diary

September 14.—SCOTTISH G.C.C.: 26 Drumsheugh Gardens, Edinburgh, 2.30 p.m.

September 19.—SCOTTISH ASSOCIATION OF GAS MANAGERS: Golf Circle A.G.M., Curling Hall Hotel, Largs, 5.30 for 5.45 p.m.

September 21.—MANCHESTER AND DISTRICT SECTION, I.G.E.: Visit to the Works of W. J. Jenkins & Co., Ltd., Retford, Notts.

September 22.—EASTERN JUNIOR GAS ASSOCIATION: Presidential Meeting, George Hotel, Colchester, 11 a.m.

SCOTTISH INDUSTRIAL GAS : NEW DRIVE TO BE LAUNCHED

A DRIVE to increase the industrial use of gas is to be launched soon by the Scottish Gas Board.

Mr. Sydney Smith, Chairman of the Board, said at a Press conference at Granton gasworks last week that he and his colleagues felt there was a great potential for the development of industrial use of gas, particularly in the central industrial belt. The Board intended to engage more industrial gas engineers in view of future developments.

Mr. Smith had accompanied Mr. David Renton, Parliamentary Secretary to the Ministry of Fuel and Power, on a tour of the works, and he made his statement in reply to a question which had been passed on to him by Mr. Renton. The question was: 'Are the Government doing anything to expand the industrial use of gas in place of oil, should oil supplies be threatened by political upheavals abroad?'

Gas Industry's Importance

Mr. Renton stressed the importance of the gas industry to Great Britain today.

'We have limited supplies of coal in this country,' he said, 'and we have to make the best possible use of that coal. The worst use we can make of it is to burn it in an old-fashioned open grate or in any kind of inefficient burning appliance. The best use we can make of coal is to send it to the gasworks where it is made into gas, coke, tar, ammonia, and a vast range of by-products.'

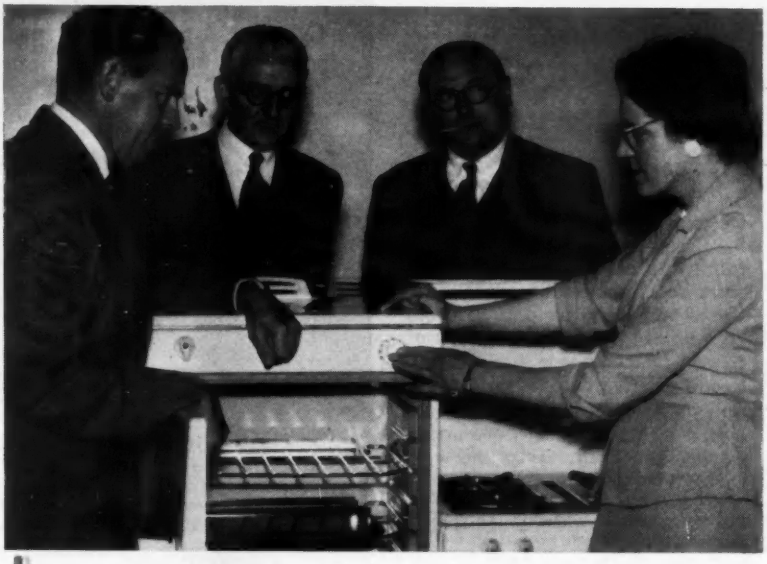
Along with Mr. Renton and Mr. Smith on the tour were Mr. David Beavis, Divisional Controller, Edinburgh, who explained the working of the plant to Mr. Renton; Mr. G. J. B. Cox, Divisional Engineer; Mr. George Mackay, Assistant Superintendent at Granton gasworks; and Mr. J. L. Warrender, Senior Scottish Officer of the Ministry of Fuel and Power.

Later Mr. Renton visited the new gasworks at Dumbarton, one of the most modern plants in the country, and on the following day he met members of the Scottish Fuel Efficiency Committee in Glasgow.

UNITED GAS
9⅝% FINAL

The Directors of United Gas Industries, Ltd., in their report for the year ended March 31, 1956, recommended a final dividend of 9⅝%, less tax, making with the interim 14% for the year. They also recommend a dividend of 1s. 1½d. per share, less tax, on deferred shares.

Profit for the year, available for appropriation, is £233,136, which, together with the amount brought forward, provides a balance of £329,636.



The Score Was Seventy One!

When the Australian touring cricket team played Essex recently at Southend Mr. Ian Johnson, captain of the Australian team, visited the Queen's Hotel where Miss Nancy Gepp was giving two cookery demonstrations to invited audiences. Mr. Johnson was anxious to purchase a cooker for his home in Melbourne. He chose a New World No. Seventy One T.T. Our picture shows left to right, Mr. Johnson, Mr. W. A. Tucker, Sales Supervisor, North Thames Gas Board, Southend, Mr. A. A. Hall, District Manager, Southend, N.T.G.B., and Miss Gepp.

COMPANY NEWS

NICO

THE Directors of Nico Light Engineering Co., Ltd., recommend a dividend of 10% and a bonus of 5%, making 15%, less tax, for the year ended March 31, 1956.

The trading profit of £47,480, compared with the previous year, shows an increase of £6,074.

Net profit, after deductions including tax, amounts to £12,547 compared with £9,400 for the previous year; taxation increasing by £4,977.

The balance to be carried forward amounts to £14,749.

FLUIDRIVE

QUOTATION and permission to deal is being sought on the London Stock Exchange for the whole of the issued share capital of Fluidrive Engineering Co., Ltd., consisting of 100,000 5½% redeemable cumulative preference shares and 250,000 ordinary shares, both of £1 each.

The Company's order book position continues satisfactory and the directors consider that for the year ended September 30, 1957, the group profits should exceed those of the current year. On the basis of profits of £150,000 before taxation, it would be the Directors' intention to recommend payment of a dividend on the 400,000 ordinary shares (it is proposed in the immediate future to offer to the then shareholders by way of a 'rights' issue, 150,000 shares at 22s. per share) of 10% less income tax.

The net assets (excluding goodwill and patent rights) of the group at September 30, 1955, amounted to £482,048, sufficient to cover the nominal amount and maximum redemption premium of the 100,000 preference shares more than 4¼ times.

AUCKLAND GAS

THE Auckland Gas Company Limited of New Zealand had an income for the 15 month period ended March 31, 1956, of £1,132,520. The trading profit was £41,134.

A dividend of 3½% is recommended by the Directors.

Sir James H. Gunson, Chairman, says in a statement that the quality of the gas produced during the period was 'consistently high grade' which was a remarkable feature about the production result from the Company's Glover West carbonising plant.

Consultative Council

S.W. SHUFFLE TO REDUCE ADMIN CENTRES

AT a Taunton meeting of the South Western Gas Consultative Council last week it was stated that a reorganisation of the Board's districts, to take effect next month, would have financial advantages and also result in a more even spreading of work and responsibility. The number of administrative centres would be reduced to 13, but the number of control centres, giving direct service to consumers, would be increased.

The Chairman (Sir Colin Campbell) told a questioner that staffing was a matter for the Gas Board. There might be some redundancy among employees, but that was a matter for the Board and not for that Council. Obviously the object of any reorganisation was to economise, so that gas could be supplied at the cheapest possible rate.

Reference was made to the Government decision that new gas and electricity fires must have guards and to the Board's policy to fit guards to existing fires at a small charge. Members stressed that children and elderly people, in particular, should always be protected against open fires.

A long discussion took place on a resolution from the Bristol-Bath Local Committee protesting against the 37½% addition to manufacturers' charges on appliances sold to the public.

'Extortionate Increase'

Councillor T. H. Martin (Bristol) thought that the recent increase from 33⅓% to 37½% was 'extortionate.'

Mr. W. J. Baker, Bath, said that in the 'bad old days' there were various prices all over the country. For at least three years, under the direction of the Gas Council, various Boards had been trying to arrive at a standardised price-on-cost for equipment and they had agreed with the manufacturers on a national figure of 37½%. This covered unloading the equipment and its storage, re-assembly, testing and delivery, in addition to clerical and establishment charges.

There was a great conflict of opinion on the Gas Council. His own view was that a percentage-on-cost was a wrong principle, because whether a cooker was £20 or £50 the cost of handling it would be the same. He favoured a flat charge for each type of appliance.

In the south-west, besides the 33⅓% on cost, there had been a cooker maintenance charge of 25s. This had now been dropped, so that with the 37½% the housewife was really nearly £1 better off.

The Board's turnover for appliances in 1955 was just over 2 mill. pounds and roughly 10%, £200,000, was profit or revenue to cover buying, selling and installation costs. Each department must as far as possible cover its own expenditure.

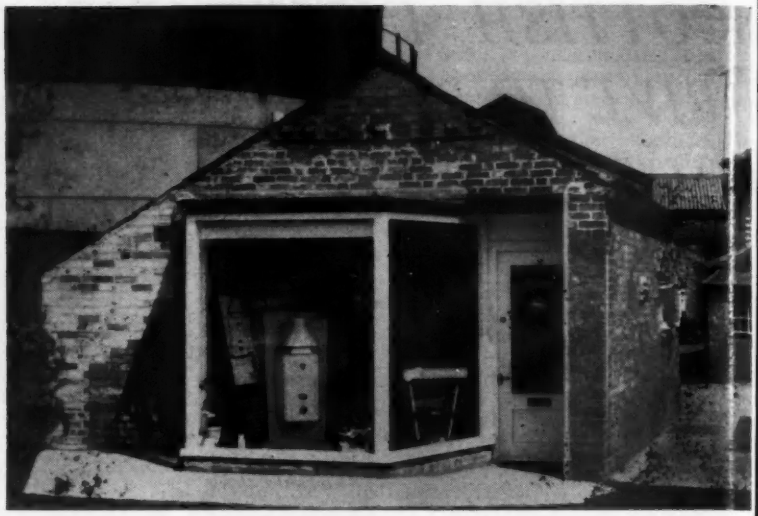
Alderman B. J. E. Belcher (Falmouth) said that what worried him was that a nationalised industry, with 'all the power in the world at its elbow,' should compete with the private concern in the sale of appliances. And was it going to say to the manufacturer, 'you have to retail a fire or cooker at so much?' If so, the cost to the public would rise in the private shop as well. 'It is all wrong,' he declared.

Discount

Mr. Baker said that the private man got a discount from the Board for selling appliances. Very few of them did installations.

Councillor C. H. Smith (Bristol) thought that in standardising the percentage at 37½% there had been a 'little hard bargaining.'

It was pointed out to him that if there was any loss on the sale of appliances it would have to be made up through gas prices.



Originally built by the Ramsey Gas Company as an office and showroom (entrance at back, small, frosted glass windows), the Ramsey undertaking of the Eastern Gas Board recently had the building modernised. As the works faces a main road, the position of the showroom is extremely eye-catching.

GAS OFFICERS' INSURANCE PLAN

The Gas Officers' Guild has made available to its members, their wives and children, group insurance securing payments to offset the cost of surgical, nursing, hospital and similar fees.

In addition to this 'private patients' scheme, a separate group accident scheme has been inaugurated, under which members and their wives may be insured against personal accidents resulting in death or total disablement.

The premiums, which are moderate, are payable annually.

ATTACK SMOKE TO CUT COSTS—

Sanitary Inspector

SMOKE abatement pays dividends, says Greenock's Chief Sanitary Inspector, Mr. A. M. M. Connell.

In his annual report he gives examples of how local firms, by adopting smoke abatement methods, have cut their coal costs and increased the efficiency of their plant. 'At present-day prices,' he maintains, 'it pays to reduce smoke—which is after all unconsumed coal.'

One large factory, he says, altered old-fashioned methods of firing by installing up-to-date chaingrate mechanical stokers. By doing so this firm cut its fuel costs by 5% and, because of the increased amount of steam produced, increased the overall efficiency of the plant by 7½%.

FLOODING CUTS GAS SUPPLY AT JEDBURGH

THE floods which brought widespread havoc to the Scottish borders on August 28 were responsible for the cutting of Jedburgh's gas supply. The flood torrent rushed down the hillside straight into the gasworks, flooding them and putting the three furnaces out of commission.

'It is the worst I have ever seen in my life,' said Mr. John Shea, the gas works Manager, who is due to retire in a few months' time.

A reserve supply of gas allowed housewives to cook the mid-day meal and prepare an early tea before the cut-off. Employees worked through the night to restore the supply.

UNITED STATES GAS SALES SOAR

Natural Gas Supplies Increase

INCREASED natural gas supplies in the United States account for large increases in revenue and in gas consumption for the year ended March 31, 1956, according to American Gas Association statistics just issued covering the operation of pipeline companies and gas utilities.

Total operating revenues of the gas utility and pipeline industry were $5,539 mill. for the period ended March 31, 1956, a new peak, and 16% above the comparable period of last year. Operating expenses increased by $479 mill. to a total of $3,698 mill., up 14.9%; depreciation, retirements, depletion, and amortisation charges were higher by 10.2% and federal income taxes jumped $100 mill., 27.7%. As all other taxes increased only 16.9%, the combined overall tax accrual was held to $745 mill., 23.3% higher than a year earlier. The total percentage increase, however, was equal to 15.7% as compared with the 16% gain in operating revenue, resulting in net operating revenue of $729 mill., up $108 mill., or 17.4% over the same period of last year.

After including an increase of $9 mill. in long-term debt interest charges and other income deductions, partly offset by an increase of $7 mill. in other income, the net income of $565 mill. was up $106 mill. over a year ago, an increase of 23.1%.

90% of Revenues

The natural gas utility and pipeline section, accounting for more than 90% of the gas industry revenues also recorded a new high peak with operating revenues at $5,025 mill., an increase of 16.2%. Operating expenses, depreciation, and tax accruals amounted to $4,347 mill. up $608 mill. over last year, an overall increase of 16.3%, almost matching the gain in revenue. Operating taxes accounted for $127 mill. of the increase, while depreciation, retirements, depletion and amortisation accounted for another $32 mill.

After providing for interest payments and other deductions, net income of $517 mill. for the twelve months ended March 31, 1956, represented an increase of $90 mill., again of 21.1% over the comparable 1955 period.

13.6% Higher

In the 12 months ending March 31, 1956, the total revenues from ultimate consumers of the gas utility and pipeline industry were 13.6% higher than in the same period last year, rising to a total of $3,601 mill. The most significant gain occurred in industrial consumption, where revenues rose 15.2%, to $968 mill. Revenues from domestic consumption rose 13.2%, to $2,110 mill., while commercial revenues advanced to $443 mill., an increase of 13.2%. The largest increase in sales occurred in domestic consumption, where sales of 23,428 mill. therms were 11% higher than a year earlier. Commercial sales of 6,257 mill. therms were 10.3% greater, while industrial sales advanced 7.4% to a total of 35,995 mill. therms. This is shown in the following table.

Table 1.—Total Gas Utility Sales, United States, 12 months ending March 31, 1956.

Sales in 1,000 Therms.	Twelve months ending March 31, 1956	1955	Per Cent. Change
Total ..	68,679,900	63,261,400	+ 8.6
Residential	23,428,300	21,108,700	+11.0
Commercial	6,256,800	5,670,300	+10.3
Industrial ..	35,995,400	33,518,500	+ 7.4
Other ..	2,999,400	2,963,900	—
Revenues.			
Total ..	$3,601,033,000	$3,171,094,000	+13.6
Residential	2,109,788,000	1,863,632,000	+13.2
Commercial	443,143,000	391,624,000	+13.2
Industrial ..	968,305,000	840,789,000	+15.2
Other ..	79,797,000	75,049,000	—

Natural Gas

Natural gas revenues from all classes of customers advanced 15.3%, increasing from $2,710 mill. to $3,125 mill. Commercial revenues were up 16.3%, domestic revenues gained 15.3% and industrial were 15.6% higher. Revenues from domestic customers during the twelve month period aggregated $1,761 mill. while industrial revenues totalled $911 mill.

Sales of natural gas were 8.7% greater than in the year ending March 31, 1955, advancing from 59,845 mill. therms to 65,051 mill. Sales to industrial consumers rose 7.4%, advancing from 32,825 mill. therms to 35,242 mill., and sales to domestic and commercial consumers also increased by 11.5% and 11.3% respectively.

Table 2.—Natural Gas Utility Sales, United States, for year ending March 31, 1956.

Sales in 1,000 Therms.	Twelve months ending March 31, 1956	1955	Per Cent. Change
Total ..	65,050,900	59,844,800	+ 8.7
Residential	21,062,700	18,888,300	+11.5
Commercial	5,780,000	5,193,100	+11.3
Industrial ..	35,242,400	32,824,800	+ 7.4
Other ..	2,965,800	2,938,600	—
Revenues.			
Total ..	$3,124,566,000	$2,709,821,000	+15.3
Residential	1,761,264,000	1,526,916,000	+15.3
Commercial	375,203,000	322,746,000	+16.3
Industrial ..	910,702,000	787,512,000	+15.6
Other ..	77,397,000	72,647,000	—

Manufactured and Mixed Gas

Revenues received from the sale of manufactured and mixed gas increased 3.3% over the like period ending in 1955, rising from $461 mill. to $476 mill. Revenues from domestic consumption increased 3.5% to $349 mill., industrial revenues were up 8.1%, while revenues from sales to commercial users were down by 1.4%.

Sales during the 12-month period increased 6.2% to a total of 3,629 mill. therms. Domestic sales totalled 2,366 mill. therms, an increase of 6.5% over the comparable cumulative period. Industrial sales increased 8.5% to 753 mill. therms, while commercial sales of 476.8 mill. therms were down 0.1% from the 477.2 mill. therms sold one year earlier.

NEWS IN BRIEF

THE Extra-Mural department of the University of London is holding a course of lectures and discussions on technology and industry beginning in October. Details can be obtained from University of London, Senate House, Malet Street, W.C.1.

'F is for Flame . . .' begins the Gas Council's advertisement in the fourth issue of the British Trades' Alphabet, published on September 1. One million copies of the 'Alphabet' are printed each year for free distribution to schools, and prizes are offered for children's essays based on the 26 advertisements it contains.

Hydronyl Syndicate, Ltd., have changed their telephone number to Knightsbridge 6803. Dr. R. Lessing, the principal of that company, has also changed his telephone number, to Knightsbridge 8935.

British specialist troops were to be called in to help run Singapore's gas services following a strike by gas workers on August 28.

Seaton Valley (Northumberland) Urban Council has asked the Northern Gas Board to relax its regulation, as far as pensioners are concerned, whereby a minimum charge of 10s. is made per quarter for gas, even though this amount has not been consumed. The Council has asked the Board to receive a deputation to discuss the subject.

Mr. J. R. Bevins, Parliamentary Secretary to the Ministry of Works, will open the Building Trades Exhibition on October 16.

WARMER HOMES EXHIBITION

Mr. J. A. Boyd-Carpenter, Minister of Pensions, opening the 'Warmer Homes Exhibition' at Kingston-on-Thames on September 4, said: 'We in this country have been brought up with the idea that coal is a cheap and abundant commodity and we have taken some time to adjust ourselves to the fact that it is really a valuable thing and not inexpensive.'

British Association Needs Funds Says General Council Statement

THE British Association is seriously handicapped by lack of funds according to a statement by the General Council issued after the deliberations of a special Committee under Sir Ben Lockspeiser. The Committee had been appointed to 'examine the functions of the British Association in the present day world.'

The statement said that the British Association remained unique as an independent institution of national reputation.

Founded in 1831 to convince an indifferent public and Government that science was important and worth backing, the Association 'succeeded magnificently in its original purposes.'

Today science was of paramount importance to the country, added the statement. Although the Association could no longer hope to finance major research projects or to provide a platform for the immediate proclamation of scientific discoveries, other urgent tasks presented themselves.

New World

Science had brought into being a new world, in which the peace and prosperity of all peoples were increasingly dependent on each other—dependent because the units of organisation (social, economic, political and national) were larger and their control more centralised.

The continuance of science was vital to modern society and continued public goodwill was essential.

'To ensure this the methods and results of science and the nature of fundamental research must be better understood by those concerned with government, industry and business and the public at large. Such understanding is essential because in any democratic state an informed public is necessary if valid decisions are to be taken.

'The public—as taxpayer and consumer—pays for science; if, in the future, scientists and technologists are to be forthcoming in the numbers that the nation's wellbeing demands, the public should learn to value the contribution of science and come to appreciate the potential satisfaction and opportunity for service implicit in careers devoted to science.'

How then could the British Association contribute to this end? At present its main opportunity for service lay in the great annual meetings which were attended by representatives from every branch of science; by industrialists, government servants, agriculturalists and many who were interested and involved in the applications of science; by teachers, representatives of the Press, radio and television (and indirectly and invisibly by *their* own audiences); by laymen interested in the progress of science and its social implications.

The Association was of the opinion that the meeting should, broadly speaking, attempt to do three things. First, it should offer a platform on which leading scientists could discuss their work in all its theoretical complexity; secondly, it should encourage scientists to discuss in joint sessions problems in related fields and to develop common problems involved in subjects on the frontiers of present knowledge. 'For if communication between scientists is limited, the advance of science is retarded; and new outlooks and avenues of enquiry may emerge from such juxtaposition of the work of different specialists.' Thirdly, the meeting should provide for non-specialists—whether they be scientists outside their own field or interested laymen—an annual stocktaking in intelligible language which would review the progress of science and help to make clear its significance and possible consequences.

It was imperative that scientists and laymen should be seen to accept the need to foresee and debate the social and political consequences of science. Prominent industrialists and political leaders should be invited to contribute to such sessions in order to put the problems in their wider setting. Such discussions should also serve to make it clear that modes of thought, other than the scientific one, must contribute to the solutions of situations arising out of scientific discovery.

The statement said it was proposed to set up a programme committee which would supplement the contribution of the section committees and would attempt to ensure a balanced programme for the meeting as a whole. But the Association could not work entirely on its own.

Press Support

'It is aware of the major contribution which the Press of this country has made and is continuing to make, not only to the success of the Association's work, but also to developing and encouraging public interest in science. Without the support of the Press the Association cannot hope wholly to succeed in its tasks. It is firmly of the opinion, however, that much more remains to be done in consultation with the Press, radio and television authorities to make more effective public use of the mass media of communication.'

Development

The annual meeting, however, lasted for one week a year only, and other forms of service were necessary. There was a need for the publication of a suitably planned and presented non-specialist scientific journal; for the holding of special one-day meetings on specific subjects for industrialists and others to discuss problems with the country's leading scientists and administrators.

In its desire to develop its public services, the Association found itself seriously handicapped by lack of funds. 'To undertake additional tasks of the sort suggested is beyond the present resources of the Association with its small permanent staff.

'The Association has in the past been able to keep its working expenses at a low level, but only because the generous hospitality offered by cities has provided a large part of the cost of its annual meetings and because it has been loyally and generously served by a large number of unpaid officers.

'The Association feels,' concluded the statement, 'that it has a continuing contribution to make to the life of the nation, and intends, when possible, to implement its declared aims in some of the ways suggested above.'

STEEL CO. OF WALES PLACE ORDERS

ASHMORE, Benson, Pease & Company of Stockton-on-Tees, a member firm of the Power-Gas Group, has been entrusted with the construction of a new blast furnace and an unloading and a stocking bridge for the Steel Company of Wales. The value of these contracts is approximately £2 mill.

The furnace will be the fifth that this Stockton firm has built for the Steel Company since the end of the war. This furnace is designed to be the largest known to the western world and will be charged mainly with ores that have been prepared and enriched by sintering.

The ore unloading and stocking bridge will also be the fifth of these units to be supplied by the same makers. This array of unloading equipment will discharge ore-carriers at a rate which far exceeds the facilities at any other port in the country.

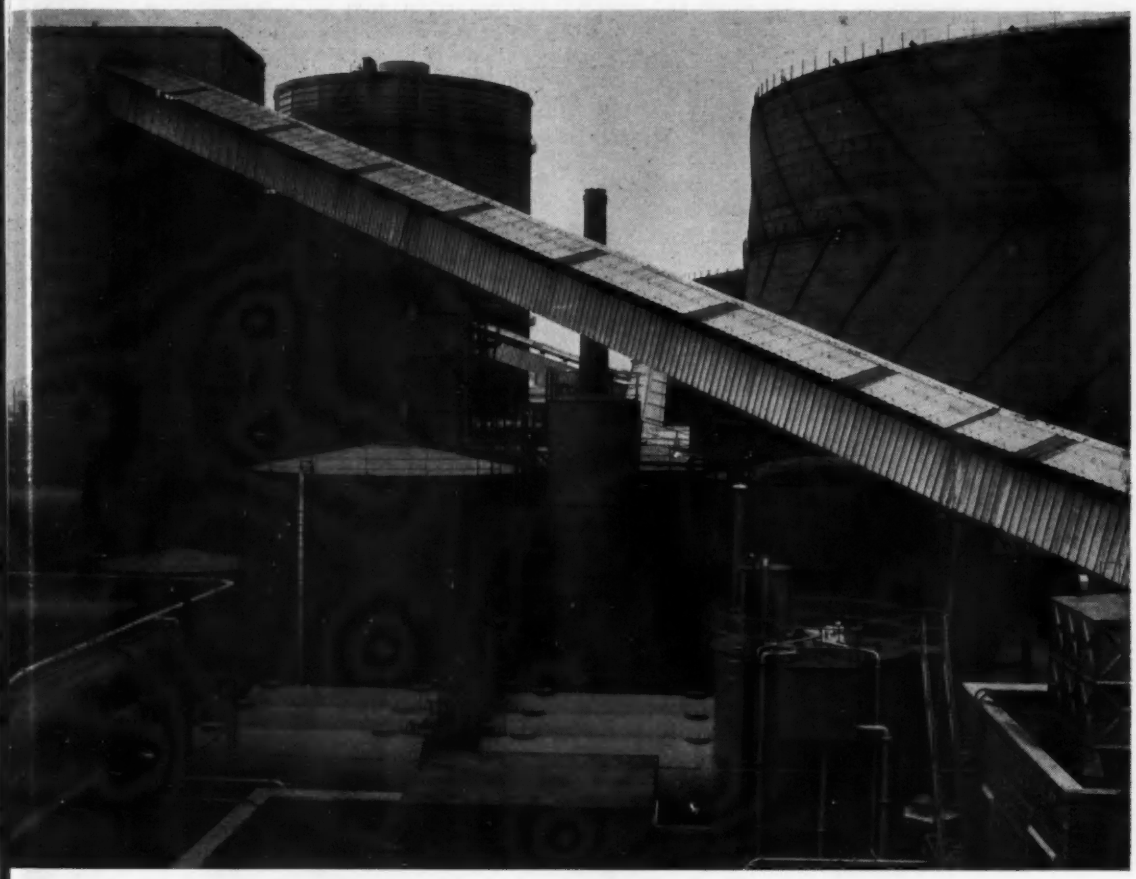
CARBONISATION PLANT OPENS SOON

N.C.B.'s 'Biggest Project'

THE new £10 mill. coal carbonisation plant at Wingerworth, near Chesterfield, will be opened by Mr. Aubrey Jones, Minister of Fuel and Power, on October 30.

The plant will go into full production shortly after it is opened and convert over 2,000 tons of coal daily into coke, gas and by-products.

This is the biggest single project ever undertaken by the National Coal Board.



A view of the works showing the two gasholders, coal storage bunker and liquor tanks.

DEVELOPMENT OF CAR HOUSE WORKS, ROTHERHAM

C. E. MILLS, A.M.I.Mech.E., M.Inst. Gas E., Divisional Engineer, Sheffield and Rotherham, and F. G. PYPER, M.A., M.I.Mech.E., M.Inst.Gas.E., M.Inst.F., Chief Engineer, Headquarters, read this paper last May to the East Midlands Gas Board Staff Conference at Skegness.

★

AFTER a slight reduction in gas consumption at the end of the war, the demand increased in Sheffield to such an extent that industrial gas was severely rationed in many weeks during the three winters before nationalisation. It was decided in 1947 that additional plant was necessary and an enquiry was sent to contractors for an intermittent vertical chamber plant to be erected at the Grimesthorpe works. Later, at the suggestion of the Chairman of the Board, Mr. H. F. H. Jones (now Sir Henry Jones, Deputy Chairman of the Gas Board), it was decided to transfer the plant to the Car House works at Rotherham, mainly because it had more room for storing and handling coke. On account of the steel shortage the completion of the plant was considerably delayed, so that the plant first made gas in December, 1955—a little more than eight years after the enquiry was sent out.

Since the large-scale development of the industrial gas load in Sheffield, the difference in consumption between summer and winter has been much less than in those districts where the domestic load is still predominant. On the other hand, the gas consumption at the weekend is much less than in the other five days of the week. In spite of the apparent advantages of the good annual load factor, the hard core of coke oven gas which is received in Sheffield makes it necessary to have plant with the greatest possible flexibility of output. The other major consideration in deciding what type of plant ought to be installed was the coke to be made. The coke sold generally in the Sheffield area is from the local coking plants. It is a hard coke, clean and well graded, and is generally made from washed slacks. It is, therefore, free from 'bats.' It was considered at that time unlikely that the quality of coal would be sufficiently consistent to make possible the manufacture of a coke free from bats, unless the coal was crushed and the bats distributed in the form of fine ash evenly throughout the coke made. If the coke was prepared in this way, true blending would be possible and advantage could be taken of weakly caking and non-carbonising coals in general, which might be available at more attractive prices. The facility of blending would also make possible variations in the quality of the coke by varying the constituents of the coal blend. These three considerations, the flexibility of output of gas, the type of coke suitable for the local market and the possibility of using a wider variety of coals, which stems from it, were the main considerations affecting the choice of plant.

Coke oven plant best meets these requirements, and would have been chosen had there been room for such a plant on the

Benzole scrubbers.
(Photo by courtesy of W. C. Holmes & Co., Ltd.)

Grimesthorpe site. When the proposal to transfer the plant from Grimesthorpe to Car House arose, the possibility of a coke oven plant was again considered, but the site was only a little more suitable than that at Grimesthorpe. And such a major alteration in planning, at that stage, would have delayed completion of the urgently-needed plant. So we turned to what we then considered the best alternative—the intermittent vertical chamber—which is in effect a coke oven on end.

By heating a coke oven plant alternatively with producer gas and its own coal gas its output can be varied from 100% down to about 50%. We therefore asked for a heating system on the same lines for the intermittent vertical chambers, but the contractors were not then prepared to modify their standard design. We had to be content with a system on which coal gas could meet the greater part of the heating requirements at weekends and at other times of low gas consumption. This compromise in the system of heating will be less efficient than the coke oven method, but so far no figures of its efficiency are available.

Advantages of Regenerative Heating

By making use of regenerative heating the coke oven ensures that heat from the fuel gases is used to carbonise the coal and only enough heat is left in the waste gases to induce sufficient draught in the chimney. With the intermittent vertical chamber, however, heat left in the waste gases is high enough to make installation of waste heat boilers economically necessary, which means that steam is made from expensive coke (and, at times, from coal gas) instead of with cheap breeze. The quantity of steam made is inflexible and it has been necessary to install turbo-alternators to use it economically.

The intermittent vertical chamber plant was laid out to handle all the coals which a coke oven plant would handle and the equipment includes breakers and hammer mills which will reduce the coal to the requisite fineness. In the original scheme, provision was made for blending bunkers; these have since been ordered and are ready for use.

In spite of the fact that it was impossible to have the plant designed fully to meet conditions which were considered desirable in Sheffield, it should prove adequate and well adapted to meet the requirements in that area.

The area of the Car House site comprises 25.42 acres and is bounded on one side by Greasborough Road and by the Sheffield-Leeds main railway line on the other. Diagonally across the site was a public 'right of way' and a condition imposed with the purchase of some additional land was that a new 'right of way,' 10 ft. wide, should be constructed around the site. The site has since been fenced with chain link fencing 7 ft. 6 in. high.

It had already been established that there would be no further working of coal measures beneath or adjacent to the site: The last coal working was completed many years ago so the site was relatively free from further mining subsidence. Geological surveys and trial boreholes showed that rock strata, with about 20 ft. of cover, was to be found at the north eastern corner of the site and mining reports indicated that this part was least liable to further settlement. It was, in fact, the most suitable position on which to locate the heavily loaded foundation for the intermittent vertical chambers.

Removal of Telegraph Wires

Already erected on the site was a 7-mill. cu.ft. per day set of cast iron box purifiers for the purification of coke oven gas, a 2-mill. cu.ft. M.A.N. gasholder and a 3-mill. cu.ft. spirally-guided gasholder. Two 2-mill. cu.ft. per day carburetted water gas plants, with all ancillaries, including purifiers, were under construction and were put to work in 1950. It is of interest that the C.W.G. purifiers have since been installed at the Scunthorpe works. There were no workshops on the site and only limited office accommodation. The area to be developed was approximately 3 ft. below the level of Greasborough Road and the railway main line; consequently backfilling and levelling had to be carried out. In all, some 150,000 cu. yds. of fill had to be spread over the site to raise it to the correct level. Parallel with the railway main line were the London to Scotland overhead telegraph lines; the posts carrying these were located at the low level and had to be dismantled and the lines re-routed before back filling of the site adjacent to the railway could begin. The first lengths of the Board's private sidings for receipt of construction materials were then laid. Unfortunately, after this operation was complete, work on the site had to be suspended due to the shortage of steel; this caused a delay in gasmaking of at least 12 months. But consolidation of the backfilled material did take place during this period.

Essential Services

After the layout of the plant had been decided upon, work on the construction of the roads, surface water drains and sewers began. As Car House was a completely undeveloped site, there was no existing sewage system and it was arranged with the respective authorities that surface water should be drained into a separate system and discharged into a watercourse flowing into the nearby River Don. Owing to the level of the existing main sewer in the Greasborough Road and the level nature of the site, the sewage system had to be laid with minimum falls. After this work had been completed the construction of the roads was begun. As heavy loads were likely to be received before the construction of the works was finished it was considered advisable to lay the curbs and pitch the roads at this stage and to leave the final surfacing until the construction of the works was nearing completion.

A new works must have all the essential services and, as previously stated, the railway main line is adjacent to the site, but water and electricity are worthy of special mention. After very careful consideration, it was decided to take a supply of water from the River Don. The existing gasworks site at Frederick Street is situated on the south bank of the river and a new pumping station, with primary pumps in duplicate, taking water from the river was constructed. These pumps discharge into a rotary filter, where solids are removed and returned to the downstream side of the pump suction, and the filtered water flows into a small reinforced concrete tank. The secondary pumps, which are also in duplicate, deliver the water through approximately three quarters of a mile of 10-in. diameter mild steel pipe into a 60,000 gal. capacity reinforced concrete storage tank above the coke screening plant at a rate of 40,000 gal. per hour. The pumping station is operated by remote control and is fully automatic.

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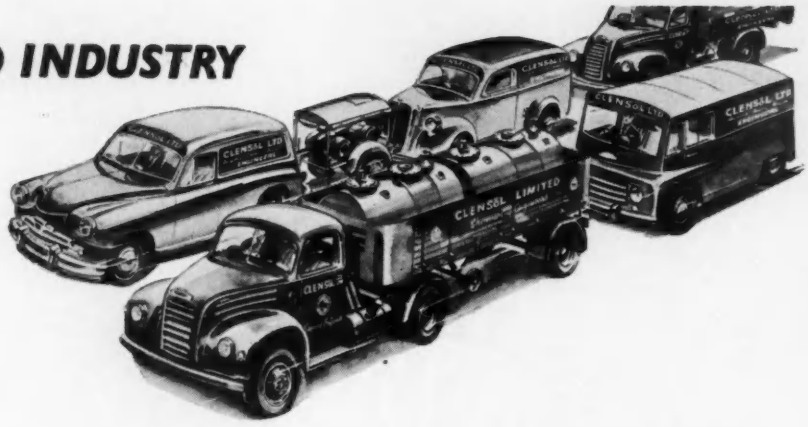

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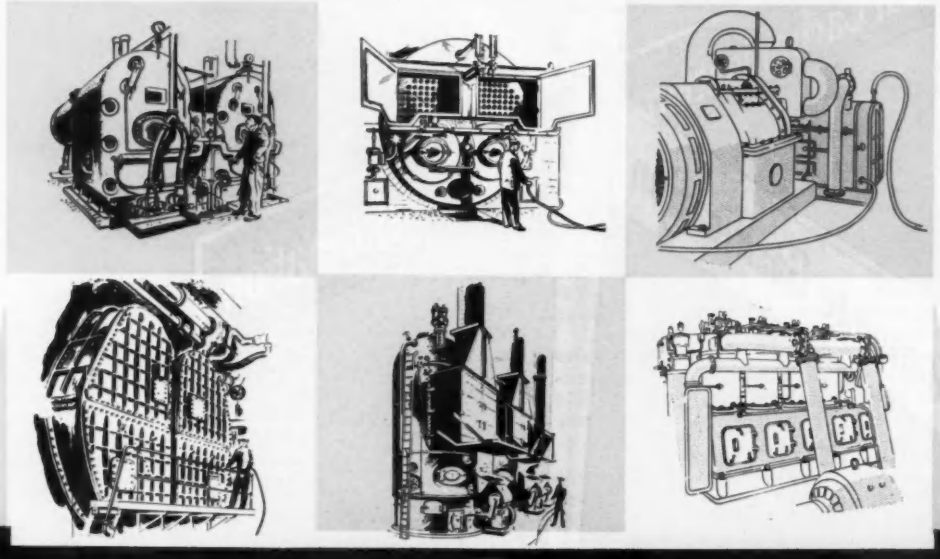

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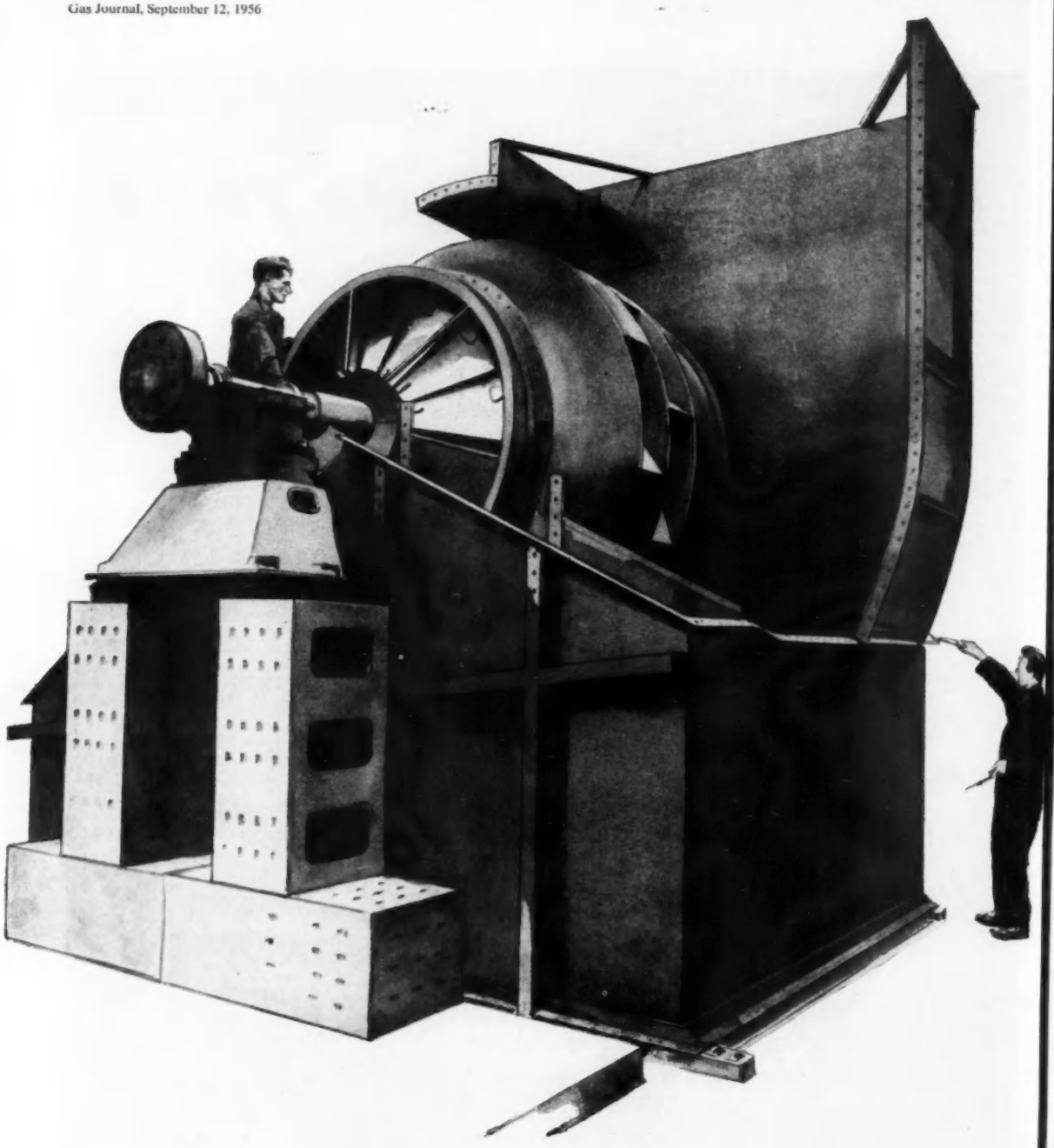

Assembling a Howden induced-draught fan with vane control

HOWDEN

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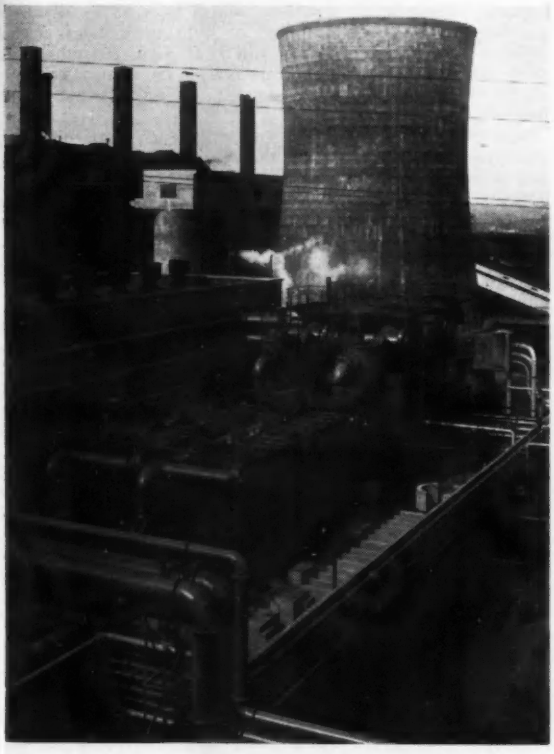
The importance of electricity on a modern gasworks cannot be over-emphasised and, although there was a 6,000 volt supply into Car House, this was inadequate for future requirements, and two separate 11,000 volt supplies, either of which would be adequate to meet the maximum demand, were therefore brought into the works. Duplicate feeders to a gasworks of this size is normal practice, but to find the transformers on these supplies located at the base of an E.H.T. grid line pylon is most unusual. Yet this was the case at Car House and, before construction of the wet purification plant could begin, a 180 ft. pylon with a 23 ft. square base had to be resited. This work was carried out by the Central Electricity Authority. The grid line still crosses the site and may transmit current generated on the Car House works.

There was available on the site a set of purifiers of normal design with a daily capacity of 7 mill. cu.ft. Rather than extend these to cope with the additional load, it was decided to install tower purifiers with all the advantages, particularly in the handling of oxide, that these provide. The old set was dismantled and re-erected at the Dinnington works where it purifies coke oven gas from the neighbouring plant of the North Eastern Division of the National Coal Board. Most of this gas was formerly purified in Sheffield, and a crude gas trunk main has thus been converted to clean gas, with advantages to the distribution system between Dinnington and Sheffield.

The base load gas to be purified daily at this works, when the extension is completed, will be 6 mill. cu.ft. of coke oven gas and 14-15 mill. cu.ft. from the intermittent vertical chambers. The Board, therefore, decided to install two units, each of 10 mill. cu.ft. per day, of Balfour Lecocq tower purifiers, complete with mechanical oxide handling plant. Due to the relatively low sulphuretted hydrogen content of the incoming coke oven gas and the peculiar week-day/weekend-day load factor, it was decided that the installation would handle intermittent over-loading by the manufacture of carburetted water gas. But before the box purifiers could be dismantled one unit of tower purifiers had to be erected and put into operation.



View of the Whessoe condensers, detarrers and ammonia scrubbers.
(Photo by courtesy of Whessoe, Ltd.)

It is significant to note that this installation was the first of its type in this country. The wisdom of the decision has been proved.

Coal Handling Plant

The coal handling plant is designed to handle all types of coal from run-of-mine to washed slacks at 200 tons per hour and includes a wagon tippler suitable for the new 24½ ton capacity mineral wagons. Provision has been made for the addition of a second tippler and duplicate conveyors to the I.V.C. house. The total length of conveyors at present in operation exceeds 660 yards.

The coal received can be either put on to the stocking area or passed through a Bradford breaker and hammer mill, where it is successively crushed to 1½ in. diameter and to 80% through ¼ in. mesh respectively. As pieces of wood, scrap iron, etc., do not break but accumulate in the drum of the Bradford breaker, and are removed periodically, a magnetic separator is unnecessary. From the hammer mill the crushed coal then passes to the blending bunkers or to the hoppers above the I.V.C. plant.

The four reinforced concrete bunkers are complete with mixing tables and have a total capacity of 1,000 tons. The hoppers above each bench of intermittent vertical chambers have a storage capacity of 48 hours. The stocking area has a capacity of 20,000 tons and a drag scraper both puts to and recovers from stock coal at the rate of 200 tons per hour.

The I.V.C. plant now at work carbonises 600-650 tons of coal per day and produces 8.5-9.5 mill. cu.ft. of gas. It comprises 84 Woodall-Duckham 3¾ ton intermittent vertical chambers in four benches, each of 21 chambers, all built on mass concrete foundations. The settings are designed for heating either with producer gas generated from coke in Humphreys and Glasgow producer gas plants or with coal gas. The producers are large enough to supply sufficient gas for dilution of the incoming coke oven gas and the gas from the intermittent vertical chambers. Each bench is complete with a waste heat boiler capable of generating 5,150 lb. of steam per hour at 200 lb. per sq. in. and superheated to 600°F.

Coke Handling Plant

The coke from the chambers is discharged into a coke skip. After quenching the skip is transported and the coke placed on the wharf where, as in coke oven practice, there is provision for spot quenching. By careful control of the quantity of water used in quenching, the moisture content in the coke can be satisfactorily controlled. The coke wharf, which is lined with blue brick, is constructed at an angle at which the coke will slide freely when the finger gates are opened. The coke moves by gravity on to a belt conveyor and is either taken to the coke screening plant or to stock. The coke handling and screening plant has a capacity of 50 tons per hour and the total length of the conveyors in the system is approximately 1,000 yards. The screening plant is a combination of vibratory and reciprocating screens. There are two lines of screens and coke cutters are included. The 600 ton capacity bunker beneath the screens is divided into sections to hold Nos. 1, 2, 3, and 4 size coke and breeze.

The conveyor system beneath the bunker is designed to take coke from the bunker outlets and deliver it either to the hoppers serving the producer gas plant in the I.V.C. house or to the C.W.G. plant hoppers. Debreezing screens are fitted to the bunker outlets and all coke sold is debreezed before it is loaded into road or rail vehicles. Automatic bagging and weighing machines are installed. Unscreened coke from the stocking field is fed back into the system via a reclaiming hopper at ground level.

Wet Purification

The gas is brought from the I.V.C. house in two separate streams, two benches of I.V.C. per gas stream, each rated at 4½ mill. cu.ft. per day. It then passes through primary water tube condensers, Roots-type exhausters, secondary condensers, electrostatic detarrers and ammonia washers, before it is metered. These items of plant, excluding the exhausters, are erected in the open on a raised concrete plinth and all the mild steel gas mains are overhead. Producer gas for dilution is handled and metered separately before it is mixed with the coal

View of the Balfour Lecocq tower purifiers.
(By courtesy of Henry Balfour, Ltd.)

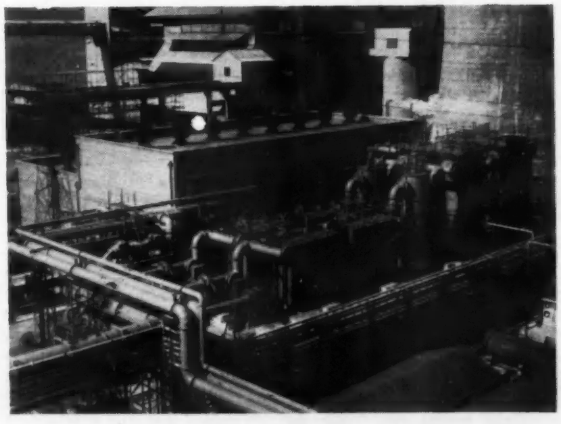
All photographs in this article are reproduced by courtesy of the East Midlands Gas Board and the Woodall-Duckham Construction Co., Ltd., chief contractors.

gas streams in a common 42 in. diameter main at the inlet to the naphthalene scrubber. The mixed gases are passed through a tower scrubber for the removal of naphthalene. The scrubber, constructed from mild steel plate, is 9 ft. diameter and 50 ft. high and is fitted with timber laths, closely spaced to ensure even distribution of the gas and maximum area of contact. The gas enters at the bottom and leaves at the top and the wash oil is distributed over the timber filling at the top of the scrubber at a rate of approximately 7,000 gal. per hour.

Tower Purifiers

The tower purifier installation comprises two units, each rated at 10 mill. cu.ft. per day. Each unit consists of five working towers and each tower contains 18 trays. There is a stocking tower for storage of the trays when they are removed from a tower and a stocking frame for holding the trays charged with fresh oxide. The overall dimensions of the installation are 236 ft. long by 30 ft. wide by 70 ft. high.

The crude gas from the nearby Dalton Main and Rotherham Main coking plants of the National Coal Board and the carburetted water gas join the gas stream from the intermittent vertical chambers at the inlet to the purifiers. The tower purifier structure, fabricated by welding from R.S. sections and mild steel plates, is erected on elevated reinforced concrete foundations supported on piles, and the installation is laid out for mechanical handling of the oxide. Over 1,650 tons of steelwork were used in the construction of this installation.



Condensers, detarrers and scrubbers.
(By courtesy of Whessoe, Ltd.)

The mixed gas stream leaving the tower purifiers passes through two tower scrubbers for the removal of benzole and sulphur. These tower scrubbers, which have 48 in. diameter gas connections, are constructed of mild steel plates riveted together and are 9 ft. diameter and 95 ft. high. Together with the naphthalene scrubber they are erected on a raised concrete plinth while the stills are erected on an adjacent pump house.

The two vacuum-type stripping stills, each 9 ft. diameter, constructed of cast iron, distil the benzolised oil, and the benzole plant, with an oil circulation rate of 30,000 gal. per hour, is designed for maximum benzole recovery of approximately 2½ to 3 gal. per ton of coal carbonised and for desulphurisation of the gas. The plants, complete with graphic instrument panels, are fully automatic in operation. The benzole and naphthalene made is stored in tanks which are arranged in a compound.

Gasholders

As previously stated, there were already two gasholders on the site and an order had been placed before vesting day for the erection of a third holder of 3 mill. cu.ft. capacity. With the installation of coal gas manufacturing plant at this works and the unusual week-end/week-day load factor in the Sheffield and Rotherham Division, it was essential to increase the gasholder storage at the grid connected works. The order for the 3 mill. cu.ft. holder was therefore amended to cover the erection of a 6 mill. cu.ft. holder. This is a four lift, spirally-guided holder in a steel tank and is of riveted construction. The tank is 230 ft. diameter and the holder is 212 ft. high when fully inflated. The weight of steel used in the construction of this holder was 2,860 tons. The foundation for the holder is supported on 908 Franki piles, driven to an average depth of 16 ft. 3 in. The holder was put into commission in December, 1954.

The water as extracted from the river is unsuitable for use in boilers and, since town's water is not available for this purpose, it was necessary to install water treatment plant. This comprises hot lime-soda treatment, followed by base exchange and acid stabilisation. The chemical plant is housed in a brick building but the other vessels are in the open. A filte

press for making the sediment into cakes is installed and the rated capacity of the plant is 6,000 gal. per hour.

Turbo-Alternators

Two 1,150 kW turbo-alternators are installed for operation on steam at 200 lb. per sq. in. superheated to 600°F. They are designed for pass out steam at 20 lb. per sq. in., at which pressure it is used for process work. The alternators which work in parallel with the grid supply can also put current back into the grid, while the electricity distribution for the works is controlled from a board located in the building housing the turbo-alternators. Most of the mechanical equipment on the works is electrically driven, necessitating the use of some 185 motors, with a combined horse-power of over 2,200.

Concentrated Ammonia Liquor Plants

Two plants, each capable of treating 750 gal. of liquor per hour, have been erected and the installation is designed for the addition of a third plant when the extension to the I.V.C. plant is added. The plants recover free ammonia only and are designed for the addition of a dephenolation plant if this should prove necessary. Graphic instrument panels and automatic controls have also been included.

To cool the water leaving the primary gas condensers, the turbo-alternator steam condenser and the C.W.G. plant condensers, a natural draught cooling tower has been installed. This has been erected adjacent to the building housing the turbo-alternators. The tower, which is constructed on a piled foundation, is of hyperbolic form, is 73 ft. 6 in. diameter at the base and 105 ft. high; it is constructed of concrete and is capable of cooling 212,800 gal. of water per hour through 30°F.

To cool the water after it has circulated through the secondary gas condensers, benzole plant coolers, liquor concentration plant and over the rack coolers, a reinforced concrete two-cell induced draught cooling tower has been constructed adjacent to the primary water cooling tower. This tower, 40 ft. 9 in. long by 20 ft. 9 in. wide by 50 ft. 6 in. high, is built on a piled foundation and is capable of cooling 66,000 gal. of water per hour through 26°F.

The tar and liquor from the I.V.C. house drains into an underground reinforced concrete sump. The sump, complete with concrete roof, is divided into four compartments; a hot weak liquor compartment of 2,500 gal., a liquor compartment of 5,000 gal., a tar compartment of 8,000 gal. and a separator compartment of 6,000 gal. The hot weak liquor is cooled and recirculated in the ammonia washers and the tar is pumped to the tar storage tank. The tar and liquor condensed from the gas in the primary and secondary condensers and that from the electrostatic detarrers, is collected in tanks located beneath the raised plinth, on which this plant is erected. From these tanks, the tar/liquor mixture is pumped to a tar and liquor separating tower, which is 12 ft. diameter and 45 ft. high. It is constructed from mild steel plate welded together and is complete with a steam heating coil. There are three cylindrical tanks, 39 ft. 6 in. diameter by 35 ft. 3 in. high, of welded construction each with a capacity of 200,000 gal. Two of these tanks are for the storage of crude liquor, and the third is for the storage of tar. A smaller cylindrical tank, 24 ft. 6 in. diameter by 19 ft. 6 in. high, with a capacity of 55,000 gal., has been erected for the storage of concentrated ammoniacal liquor.

Stores, Office Building, and Workshop

A steel-framed brick building, 206 ft. long by 36 ft. wide by 41 ft. high, to accommodate the offices, stores, canteen, laboratory, official gas testing station, first aid rooms and ablutions, has been constructed adjacent to the works entrance. Telephonic communication is maintained to all important sections of the works and there is a master control system for the clocks on the works. A steel-framed maintenance workshop, 228 ft. long by 36 ft. wide by 31 ft. high, equipped with a wide range of machine tools, is capable of dealing with all repairs to gas-making plant. Separate sections are included for the carpenter, instrument mechanic, and the electricians. Repairs to the two 150 b.h.p. diesel locomotives are carried out in the locomotive shed which is suitably designed. There is also a garage block with a maintenance section.

Fig. 1 shows diagrammatically the position of Car House works relative to the other works in the Sheffield and Rotherham Division. All the gas from this works—except for the supply to the Masborough district, which is boosted—is compressed into the grid system. The compressor and booster house is erected adjacent to the turbo-alternator house and in it are housed the 400,000 cu.ft. per hour at 27 in. w.g. boosters

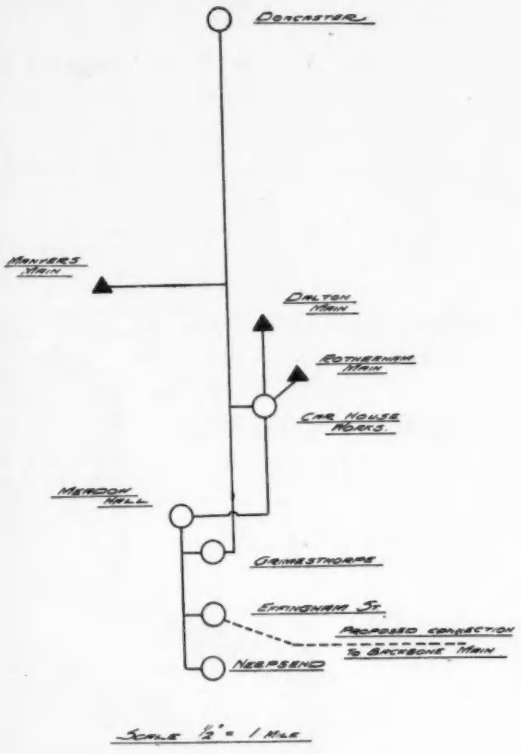


Fig. 1.

for the Masborough district and the 300,000 cu.ft. per hour reciprocating compressors at 12 lb. per sq. in. for delivering gas either to the Meadow Hall works or into the grid. These compressors will ultimately be used to pump gas to Meadow Hall only and additional compressors, rated at 260,000 cu.ft. per hour at 30 lb. per sq. m., will be installed for pumping into the grid. This higher pressure will be necessary when the purified gas is received from the new coking plant now under construction by the National Coal Board at Manvers Main.

I.G.E. SAFETY RECOMMENDATIONS

THE following additions and amendments have recently been published by the Institution of Gas Engineers to their Safety Recommendations. It will be noted that in the gasholder section pamphlet G17 takes the place of G1-G6 and G8-G10, leaving G7 still valid. The displaced pamphlets should be removed and destroyed. The items M7 and D4 are new additional items.

(a) 'Gasholders' section contents page (amended).

(b) G.17 (I.G.E. Recommendations for Gasholders), which is to *replace* existing items as noted on sheet (a) above. (Attention is drawn to the fact that existing item G.7 remains valid.)

(c) M.7 (Note on Coke Fires). (This is a new item.)

(d) D.4 (Recommendations to Prevent Accidents during the Cutting Out of Gas Mains for Repairs and Alterations) for use with cast iron and steel mains with pressures not exceeding 50 lb. per sq. in. This is a new item.

Wellman-Galusha Gas Producers

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'Co-ordinate the Fuel Industries'

—Says Mr. William F. Cummings, A.M.Inst.Gas E., A.M.Inst.F., in his Presidential Address which he delivered to the Scottish (Western) Junior Gas Association last Friday.

MANKIND is at present dependent on two developed and one embryonic source of energy: First, the energy released by the combustion of such organic substances as coal and oil; secondly, the energy resulting from naturally occurring large masses of matter such as winds and waters acting under gravity, and thirdly, the energy from nuclear fission. The continuity of an increasing power output is essential to this nation to maintain and to better its standard of living, for, where the available power per productive worker is high, so is the national income and hence the standard of living.

Atomic power may be the answer to this rising power demand, but to date the experts have been very cautious as to when such power will be available for industry. Although Calder Hall in Cumberland will soon be feeding electricity into the national grid, it looks as if many years will elapse before atomic power will make any real contribution to our fuel requirements. As energy derived from hydro-electric schemes is limited in this country, we are forced to rely on the two main sources of power, coal and oil. The former is a natural resource of Britain, but the latter must be imported, either as the finished product or as feed stock for our own refineries. Petroleum and its associated products account for only about 14% of our national fuel requirements, and will continue to play an essential part in the running of this country for many years to come, but even so coal still remains, and will remain for some time our main source of energy and power. The Ridley Report of 1952 pointed out that there is not enough coal being mined in the United Kingdom to meet all demands, and that it has only been by restricting supplies to non-industrial consumers that industry's needs have been met. A reduction in domestic consumption by 10 to 12 mill. tons per annum from pre-war, though it greatly helps the coal position, has had to be met by increased demands for gas and electricity, and the coal position had so worsened that last year this country had to increase its imports of foreign coal.

Measure of Control

Our dependency on coal being what it is, every ton of coal consumed in this country must ensure that our natural resources are being used to the best advantage, so that our dependence on other imported fuels is as slight as practicably possible. It is possible that to a great extent the trouble could, in time, be obviated, by this country adopting now a national co-ordinated fuel policy. Such a policy would not solve our fuel problems overnight as a great deal of hard thinking and hard work would be involved, but it would ensure gradually that our fuel resources were put to the best use. This would involve a certain measure of overall control on our fuel producers, distributors and consumers, and it would entail vast sums of capital expenditure to make such controls work. Though the word 'control' brings a natural revulsion to democratic minds, will not failure to do anything about our fuel position now bring economic failure within the next few decades? The word 'control' is used advisedly, since many of the necessary measures may be achieved by administrative reorganisation within the fuel industries, and by parliamentary action as already envisaged in the Clean Air Bill.

It was estimated in the Beaver Report that every year, this country sends £250 mill. of unconsumed fuel up the nation's chimneys as smoke. That is a staggering sum, and we cannot afford such wastage. Every step taken to obviate such malpractice must receive our consideration and encouragement as representatives of the fuel industries. If there had been a co-ordinated fuel policy 50 years ago, many of the present-day problems would never have arisen, but then and since then, the cries of the public-spirited man have been drowned by the clamour of democracy. This lack of action in the past makes co-ordination even more important now, and the sooner our fuel resources are directed to the best use, the longer will the country continue to prosper.

The co-ordination would be a Government function and the Ministry of Fuel and Power which, from its style and title, seems the obvious choice, would appear to be well fitted for the job. Its function would be to act on the best technical advice the country can produce and to act as arbiter among the fuel industries, so that capital investment in the fuel industries would be allocated with the whole fuel field in view. The results obtained would be of advantage to all, and no one industry would get the bulk of the investment, to the detriment of the others.

Supply Anomalies

If such a system of co-ordination for fuel conservancy ever receives official consideration, there are certain practices which such co-ordination would cause to disappear. These are certain anomolies in the coal supply position. In Scotland especially, there has been a gradual sliding down of the scale of coking coals, until, if the present position is continued, coals will be identified by their 'shrinkage' number. The coking coal position in the north is, of course, acute, but surely the record of efficient conversion of coal to the secondary fuels of gas and coke, should ensure that the best coking coal available is allocated to gasworks and that industrial consumers are not found trying to burn caking slacks inefficiently. As the supplies of gas coals are dwindling, it is rather disconcerting to read in the technical Press that during the committee stage of the Clean Air Bill, the expert advice given to the Minister concerned, when smoke incidence from boilers and furnaces was being discussed, was 'that certain types of mechanical stokers are liable to emit dark smoke, if caking volatile coals are to be used.' That it should even be contemplated, in the first general Parliamentary action against the misuse of fuel, that coking coals should be allowed anywhere near industrial boilers, etc., is incomprehensible.

If the efficiency of conversion of coal to gas and coke at approximately 75-80% is compared with that of generating stations, steam locomotives, domestic usage, etc., it is fair to expect that the gas industry should continue to receive the cream of the gasmaking coals so that they may make the best use of them.

The distribution of coal to the gas industry must also be carefully investigated to ensure that overheads in the form of railway freight charges are kept to the minimum. In the west of Scotland, freight charges are a curse at the present time, especially to the larger works. In the Glasgow district alone last year, the average cost of bringing coal to the works amounted to approximately 17s. 4d. per ton, equivalent to 2.8 pence per therm on to the manufacturing cost. This figure included the sum of 35s. per ton for freightage for North of England coals, which accounts for an additional 5.25 pence per therm. The great majority of these 'imports' were to the one works, so its cost of producing gas was naturally inflated.

Minimum Costs

We must, therefore, survey the whole position to ensure that these English coals are so directed that the additional cost of coal is kept at a minimum, and no unnecessary mileage is paid for. In fact, the Scottish Gas Board has taken steps within the past few months to combat such expenditure, knowing full well that every economy will ensure that the price of gas is kept down. This is a vital factor in the competitive market in which we operate.

As the supply of coals with the swelling index of between 2½ and 6 is diminishing, efforts are being made to carbonise 800/900 rank coals with a swelling index of 1 (agglomerating). The Lothian coalfields offer the prospect of large supplies of

this type of coal, and test runs have been carried out on full works scale in the west of Scotland. Two important points emerge from these experiments: The thermal yield has shown a drop of 4.68 therms per ton, and the coke yield a drop of 1.22 cwt. per ton. That would mean a loss in revenue of roughly 12s. 6d. per ton of coal carbonised. As the freightage was 7s. per ton higher than usual, the cost of these coals becomes 103s. 8d. per ton compared with the all-in price of a normal coking coal at 110s. per ton to the same undertaking. The good gasmaking coal at 110s. per ton compares favourably with these Lothian coals at 6s. 4d. less per ton, since they bring in 12s. 6d. less as revenue, with an overall loss of 6s. 2d. for every ton of low rank coal carbonised. In such circumstances, over which the industry has virtually no control, a review of the price structure is necessary. For, when the quality of a commodity is reduced, there is usually a corresponding reduction in the selling price to compensate the buyer of the inferior material and in proportion for any loss sustained, and this should be applied to the Coal Board. The gas boards must face the same problem for the quality of its products for, if an undertaking fails to meet the declared calorific value of its gas over any quarter, the Ministry of Fuel and Power can compel that undertaking to reduce its price per therm to its consumers for the ensuing quarter. For many years the industry has been forced to tolerate the gradual deterioration of coal quality. The ash content of coals has gradually increased, giving rise to trouble in gasworks' plant, coke distribution, etc., etc., and has caused decreased efficiencies and increased cost. The prospect of handling these low rank coals with their reduced gas yields and coke yields promises an even gloomier future; but surely co-ordination would at least ensure that the increased costs incurred by handling these coals were shared fairly throughout the Gas Board.

Competition

Competition between the fuel industries is a good thing. In fact, only by having such competition will the industry be able to offer the public the best and the most economic consumer service. But this needs qualifying. The practice of keeping the flag flying by a fuel service, in face of an unreasonable and untenable position, where financially the loss incurred is heavy is foolish because for each and every fuel there will be a well defined range of uses, which in the majority of cases overlaps and competition is ensured. But where, and usually for geographical reasons, a fuel service is either obsolescent or not feasible, such a service should not be subsidised by the rest of that industry. Perhaps old, inefficient industrial solid fuel appliances of all types may be in use within a stone's throw of the gas main or perhaps a small isolated gasworks, miles and miles from a trunk main, may be running inefficiently, with every ton of coal being transported along roads lined with hydro-electric pylons!

It is with the consumers of fuel, both domestic and industrial, that the greatest difficulty in implementing a co-ordinated fuel policy lies. Industry uses about 75 mill. tons of coal and 35 mill. tons equivalent as gas and electricity annually. The figure for coal is quite appreciable. The larger industrial concerns are applying the best principles of fuel technology to the operation of solid fuel appliances and their production methods, but there exist in this country vast numbers of smaller concerns where the rule of thumb predominates. It will not be a simple problem to remedy this because these small firms do not possess the know-how which would help them to realise the financial benefit to be got by laying out a little more capital to install modern fuel saving equipment.

Definite Savings

Where investigations have been carried out on industrial premises, however, by competent fuel technologists of the Ministry of Fuel and Power's mobile teams, definite savings in fuel consumption have become possible in nearly every case.

Many have been the ways suggested to bring home to industry, individually and nationally, the benefits accruing from fuel conservation, and all these should be investigated to make sure that no stone is left unturned. Advisory panels have been formed, but these are still comparatively in their infancy, and they all appear to possess only 'amateur' status, which is their greatest weakness.

The domestic consumer will be more difficult to persuade to mend his ways. The industrialist will listen to facts and figures and act accordingly. The daily Press declares that the Clean Air Bill will do away with the coal in the home. The layman, the housewife, the technologist, all agree that the absence of smoke in our atmosphere is highly desirable. But how many people have been known to declare that they themselves are prepared to do without the welcoming glow in their own homes? So many people regard smokeless fuel as a lethal agent, and many do not believe that coke can be burned in a proper appliance without asphyxiating the whole family. As many homes could not use a smokeless fuel because of incorrect combustion, an appliance is needed, marketed at a price within the reach of the average householder.

To quote from the Beaver Report: '... Neither the Government nor local authorities are likely to achieve any real measure of success unless all interests co-operate, and unless public opinion, individual and corporate, clearly demands and will support the action that is required.' The time looks ripe for a countrywide campaign to ensure a higher fuel efficiency. The Clean Air Bill is the first stepping stone across a very broad ford, and it should give the necessary initial stimulus to make this nation conscious of its responsibility.

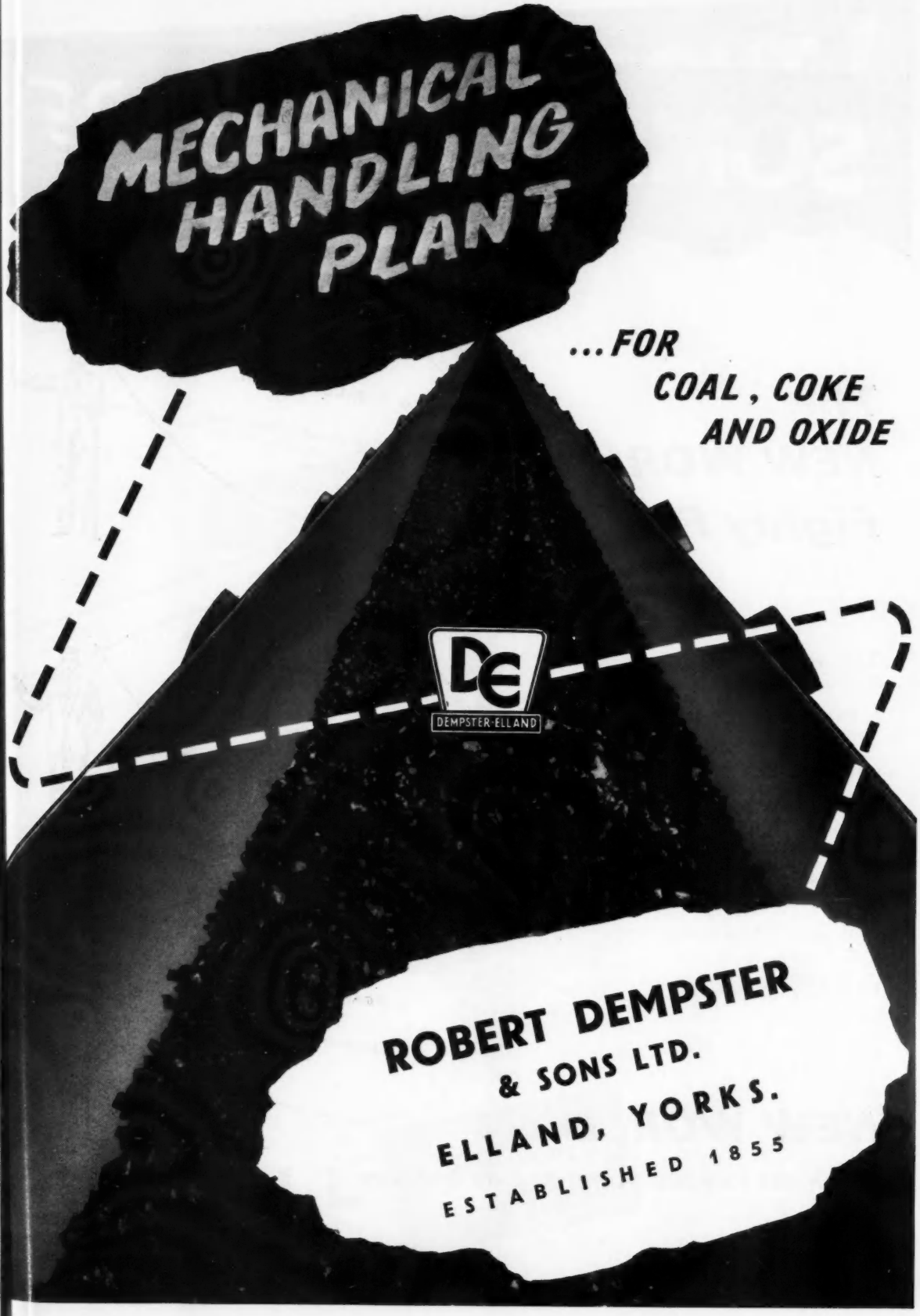
The demand for smokeless fuel should rise steeply within the next few years, depending on the fact that the public, either by legislation or conversion, will want to use more coke, but at present it is very controversial as to whether it is possible to persuade the public within the next few years to use our particular solid fuel. To meet any such demand undertakings are now laying down stocks to meet future commitments. This has meant restricting coke orders, especially for the export of coke abroad, and though many people find it hard to appreciate the immediate loss of income the sacrifice should be made to encourage the coke consumers of the future who, when they turn to us for supplies, will not be unduly disappointed. By ensuring such a continuity of supply, we will also be ensuring a certain stability for the coke market and therefore the gas industry, in years to come. The National Coal Board themselves are very interested in putting down plant to carbonise the low ranking coals to produce a free-burning smokeless fuel, in Scotland and other regions. But, surely, the gas industry is best suited to tackle this problem of increased coke supplies by virtue of its experience. Research is at present being carried on on a large scale by the industry to find means to increase coke yields, and the industry is quite ready to change from existing conventional carbonisation methods. If the National Coal Board enter the field of carbonisation in earnest, the industry will be faced with a very formidable problem. How would they dispose of the gas produced from their coke ovens? Would it be sold, freely or under compulsory order to the gas boards in the regions affected, or would they themselves enter the distribution market? By doing so they themselves would become a two- or three-fuel industry.

'Doubtful Quantity'

With the increase in coke supplies, plans are going ahead to feed into the West of Scotland surplus supplies of coke oven gas. To accommodate such an intake, and without any great prospect of a substantial increase in gas sales, the amount of coal carbonised in this area will need to be reduced, and so the amount of coke available for sale will also be automatically reduced and so will the supply of smokeless fuel. Increased coke availability therefore in this region in a few years must be considered a doubtful quantity, so also will the availability of the extra coking coal required by the present expansion of the coke ovens. Interesting experiments have been made, however, in recent months to make more coke available to the public in connection with the use of Lothian low rank coals in carburetted water gas plants. This work has been carried out locally and although it was found that the use of 100% of such coals was not economic since the plant capacity was reduced, a 50-50 mixture of coal and coke involved only a 10% reduction in gas output.

This would mean that for every 1,000 cu. ft. of C.W.G. manufactured there would be released 14 lb. of coke for sale. As the Glasgow district made roughly 2,003 mill. cu.ft. of water gas last year, the saving in coke would be considerable, to which must be added a slight reduction in manufacturing costs due to the more favourable price of Lothian coals compared with coke.

(Concluded on p. 637.)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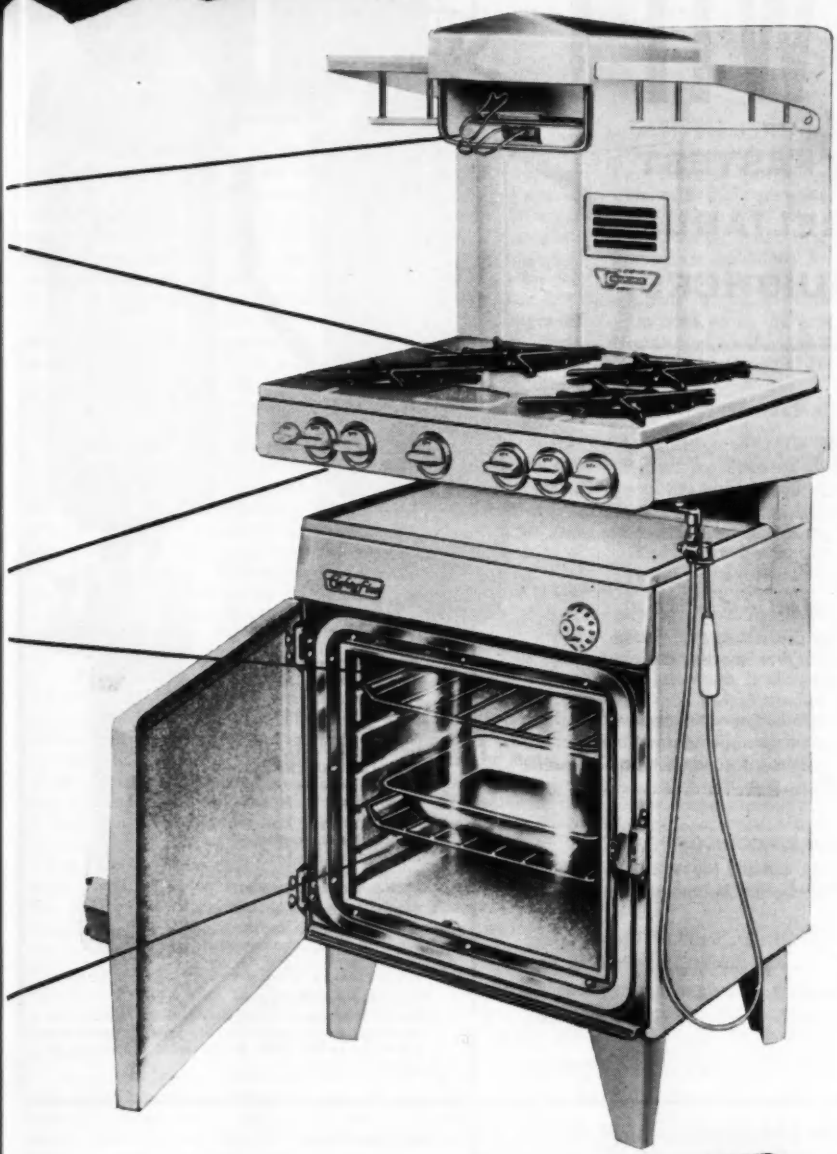

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Abstract of a Paper Presented at the Fifth World Power Conference

Developments in the Gasification of Solid Fuels in Great Britain

By F. J. DENT, D.Sc., M.Inst.Gas E., M.Inst.F.
DIRECTOR, BIRMINGHAM RESEARCH STATION, THE GAS COUNCIL.

THE shortage of coal for gas manufacture in Great Britain, and particularly of the low ash caking varieties used for carbonisation, has shown that more reliance will have to be placed on gasification processes which, in addition to requiring less coal, can use coals of all types. More carburetted water gas plants, therefore, incorporating refinements to suit post-war circumstances of costs and labour, have been installed and more interest has been aroused in cyclic processes for the gasification of weakly caking coals.

The cost of transporting such coal and the advantages of using high capacity plants will favour gasification being carried out in large works near the mines. If this is done under pressure gas of the required high quality can be easily distributed over wider areas. Research into pressure gasification processes is now being undertaken on a considerable scale.

High capacity water gas plants representing the latest water gas practice in Great Britain, have been installed by the North Thames Gas Board. The plants have been designed to give the highest possible efficiency of coke and oil conversion, efficient waste heat recovery and flexibility of output, to produce gas for both base and seasonal heating loads. The generators are capable of high rates of gasification by using blast pressures up to 60 in.w.g. Outputs of 5.9 mill. cu.ft. of C.W.G. per day have been obtained from generators of 9 ft. internal diameter.

Dry Sealed Generators

The generators are dry sealed and fitted with Haug type grates. Steam pressure in the waste heat boilers has been increased to 300 lb. per sq. in. and with superheating power is recovered in turbo-alternators passing out process steam at 15 lb. per sq. in. Because of the high blast pressure, provision has been made to remove dust from the gases between the generator and carburettor and special attention has been given to removing it from gases passing to atmosphere.

Test figures show that raising the blast pressure has given more than a 50% increase in the output per sq. ft. and that, due partly to improvements in waste heat recovery, the increase has been obtained without sacrificing the thermal efficiency of B.W.G. production which remains at approximately 60%. At times of peak demand, the 'blow-run' method of operation, where part of the gases produced towards the end of the blow is withdrawn into the water gas stream, is being increasingly used to raise the output of water gas plants still further.

The gasification of both coke and coal by cyclic processes at atmospheric pressure depends upon the use of petroleum oil for enrichment and in the past a distillate gas oil has been used. So full scale tests on the use of heavy oils for enrichment in cyclic processes are being carried out. In one case, the American practice of using an empty carburettor with manual removal of at least part of the deposited carbon is being followed, while in another, an attempt is being made to retain a chequered carburettor by relying on a special air admission to burn off deposited carbon, a method which is proving successful after modifications to the chequer work and spraying arrangements. Other trials have concerned the practice of spraying heavy oil on to the generator fuel bed.

Results are found to vary considerably with the nature of the heavy oil. A commercially available grade, with viscosity controlled to 1,000 Redwood (No. 1) secs. by the addition of recycle oil, yields 1.0 to 1.1 therm per gal. when making gas of 450 to 500 B.Th.U. per cu.ft. by spraying into the carburettor. There is some reduction in output per day, on account of the time taken to burn off or remove the deposited carbon. In the tests with a chequered carburettor, however, the reduction has amounted to 10%, but it is believed that it would have been less if design in the first instance had been for heavy oil working. Tar emulsions are formed when using heavy oil and special equipment is needed to deal with them.

Lower yields of hydrocarbons are obtained when the oil is sprayed on to the generator fuel bed. The deposited carbon contributes to the generator fuel, however, and the merit of this procedure depends upon the relative price of coke and oil.

The requirements of the seasonal load have justified the maximum performance being obtained from water gas plant by using a large graded coke as generator fuel. But the increasing demand for coke as a solid smokeless fuel for domestic purposes has encouraged the use of cyclic processes which can use weakly caking coal instead of coke, *e.g.*, the Tully, G.I., and Power Gas processes.

The thermal efficiency of cyclic processes depends on the amount of heat which leaves the generator in blow gases. For an optimum efficiency this should not exceed the amount required for such purposes as the decomposition of oil and the raising of steam for machines and process. In fact, in the design of automatic plants of recent years the thermal efficiency of the generator is determined by the heat requirements of oil cracking and steam raising, rather than by the blow reactions to generate carbon monoxide.

It may still be difficult, however, to avoid excess heat in blow gases without lowering temperatures in the fuel bed and so, the rate of gasification during the run period. This may happen when steam consumption is reduced by using pass-out steam for process work, when using small coke or coal as generator fuel, when it is preferred to raise steam from low grade fuel in external boilers, or when enrichment is obtained by the catalytic synthesis of methane from part of the blue water gas.

Experiments

Experiments therefore have been made on the recovery of excess heat in blow gases by returning it to the generator for preheating the air and steam supplies. This has led to increases both in the yield of gas from the coke and in the output of gas per day without clinker formation becoming more serious. With a horizontal retort coke the yield increased from 68.6 to 74.2 heat units per 100 heat units as coke and with a continuous vertical retort coke, from 66.1 to 72.3 heat units. The accompanying increases in output were 14% and 13% respectively.

This preheater, however, was difficult to purge, but the heat balances indicate that if losses in purging had been normal, the increases would have been approximately 10% in the thermal yield of blue water gas from the coke and 20% in the output of gas per day. By varying the gas making cycle, therefore, even higher yields could have been obtained from the coke if the gain in output had been sacrificed and vice versa.

When the preheat temperature was increased a smaller proportion of the process steam was needed to maintain the clinker at the level required until, with a preheat temperature 600°C., the back-run could be dispensed with entirely. This simplified the operating cycle and on a carburetted plant would allow more time for oil cracking, but there was, however, an

increase in the temperature at the top of the generator and the gases carried away more sensible heat. For this reason an intermediate preheat temperature of 400°C. gave the best results.

Producer Gas

Improvements in working conditions on gasworks retort installations have favoured a greater use of hot gas mechanical producers fitted with cyclones for cleaning the producer gas. In order to make graded coke available for sale investigations into the use of coke breeze in the mechanical producers have been made. It was found that the producers were capable of dealing with a feed consisting entirely of breeze below ¾ in., whether or not dust below ¼ in. was removed. The overall financial saving was, however, less than proportional to the low price of the fuel since there was a reduction of 50% or more in the output of producer gas, an increase in operating labour to deal with clinker formation, an increase in maintenance costs, and a reduction in thermal efficiency. This was due partly to a deterioration in gas quality and partly to a higher content of carbon in the ashes. A sandwich system of charging, however, by using alternate loads of coke nuts and breeze, maintained the output almost equal to that given by coke nuts alone.

Precise information has been obtained on the inter-relation between fuel bed depth, gas quality, and gas offtake temperature in the performance of coal-fired producers in the steel and glass industries, which has led to the development of devices for the automatic control of the coal feed, so that the gas quality would remain steady during rapid variations in gas demand. One design of controller depended on the temperature at which gases left the producer, while the other, on the rate of air supply to the producer with secondary action from the gas offtake temperature. When the plant was subject to large and rapid load changes, control by the air supply, although the more expensive to install, was found to be much the better. The load changes could be sudden and up to 100% without the offtake temperature varying by more than 10°, or the methane content of the gas by more than 0.2%, but when load variations were less, the cheaper control by offtake temperature was adequate and may be preferred. The automatic equipment is now on the market and is being increasingly used.

The Complete Gasification of Coal

Although the developments described above recognise the shortage of coal and the desirability of conserving coke for use as a smokeless fuel, it is such processes as G.I. and Tully which can use coals outside the range of coal types available for town gas manufacture, but even then the coal must be of large size. New gasification processes therefore are needed to deal with the increasing proportion of small and often dirty coal resulting from the mechanisation of mining. It is Imperial Chemical Industries, Ltd., who have been responsible for the first development which is a process to produce a gas suitable for hydrogen manufacture from cheap low-grade coal. In an attempt to minimise costs, the use of oxygen is avoided by employing the moving burden principle. Water gas is produced by steaming a bed of fine coal under fluidised conditions, the heat absorbed being continually replaced by circulating the coal through a second chamber in which its temperature is raised by partial combustion with air. The pilot plant yielded much information about fluidisation but revealed certain drawbacks of the moving burden process.

This is an atmospheric process working at atmospheric pressure , with a steam velocity through the fluidised bed of only 9 in. per second, so that the rate of gasification is necessarily low. To the considerable losses of sensible heat as gases left at the reaction temperature must be added radiation and convection losses from a relatively large plant, the whole interior of which is also at reaction temperature. The coal was found to disintegrate during gasification into particles so fine that cyclones could not retain them in the system and in the best of the experiments, 20-25% of the carbon supplied escaped. Cyclones were, however, able to divert the dust into the waste gases so that it could be subsequently burnt.

The economic operation of this process would seem to depend upon the considerable amount of potential and sensible heat lost in dust and gases being recovered as steam or power.

As the bulk of the town gas distributed in Great Britain is obtained by the carbonisation of coal and has a calorific value of 450 to 500 B.Th.U. per cu.ft. and a density of about 0.5 (air = 1) any extensive production of gas by gasification will require a process which will maintain these two gas properties. In cyclic processes at atmospheric pressure, the gas density is usually rather high when oil is used for enrichment, so in the case of large installations there is much to be said in favour of processes which can use coal and oil independently although with coal alone, the difficulty over gas properties is greater. A coal process must involve more than a direct reaction with steam, and must provide for a greater production of enriching hydrocarbons than is normally obtained by the thermal decomposition of the coal. It must also avoid too high a gas density by rejecting both carbon and oxygen.

The Lurgi process in Germany considerably simplified the problem by gasification under a pressure of several atmospheres. In this process the formation of methane in the fuel bed increases the production of hydrocarbons while carbon and oxygen are rejected as carbon dioxide which is readily removed by washing the gases at the working pressure.

The pressure reduces gas velocities and small fuel can be gasified at high output, with little loss of dust from the generator; the fuel can be down to ¼ in. in size and can contain as much as 30% of ash. Pressure also assists in purification and this has made possible higher standards of purity than town gas has hitherto attained. A pressure process also is suitable for the concentration of production in large works with the distribution of the gas over wide areas.

The first generator to operate on bituminous coal, although upgraded by methane formation in the fuel bed yielded a gas of only 400 B.Th.U. per cu.ft., which was still below the town gas range. Thermal efficiency must be increased and eventually the process would have to be modified to deal with powdered coal.

Lurgi themselves investigated the first of these problems shortly after the war, and obtained satisfactory operation with bituminous coal by providing a stirrer at the top of the generator to break up agglomerations and results showed that the whole range of high volatile weakly caking coals outside the carbonisable range, types 702-902 could be used.

To increase the calorific value of Lurgi gas two reactions have been employed, viz., the Sabatier synthesis reaction, using nickel catalysts, and a hydrogenation reaction with either coal or oil.

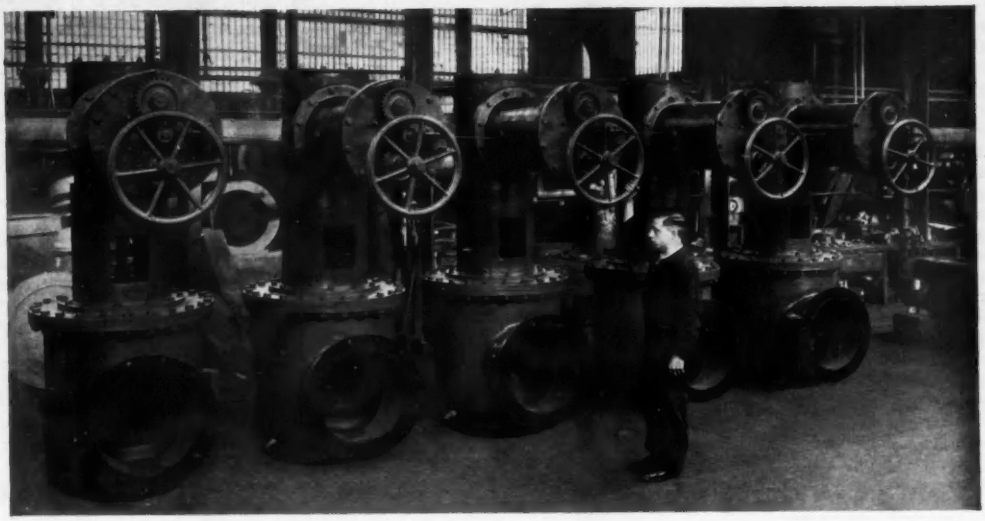
This sythensis reaction can be used to produce gas of any calorific value up to 1,000 B.Th.U. per cu.ft. and it occurs at atmospheric or higher pressure, and is independent of the nature of the fuel gasified, allowing gas of high calorific value to be produced from materials without volatile matter, *e.g.*, coke breeze. The gas must be of high purity, but the required standard can be reached, for example, during the removal of carbon dioxide by the Rectisol process. The reaction is, however, accompanied by a reduction of the potential heat as gas and, in consequence, plant costs and the influence of any inefficiency in the initial gasification are increased, though only to a limited degree, when enrichment is not great. This will become less as the efficiency of gasification processes improves, but the estimated costs for the present Lurgi process, enrichment by synthesis from 400 to 450 B.Th.U. per cu.ft., will show an increase of approximately 5%.

Hydrogenation Reaction

Further experiments were concentrated on the hydrogenation reaction which showed that, when coal was heated in a stream of hydrogen at 50 atmospheres to about 900°C., its combustible material was completely converted into gaseous hydrocarbons. The gas produced had a calorific value above 500 B.Th.U. per cu.ft. for most of the time, and reached 800 B.Th.U. per cu.ft. during the initial stages.

Pilot scale tests showed that the reaction was sufficiently exothermic to be self-maintaining and although, when temperatures were determined by reaction, the extent of hydrogenation was less than observed in the laboratory, there was no difficulty at pressures of 20 to 25 atmospheres in obtaining sufficient methane for the production of gas of 500 B.Th.U. per cu.ft.

The non-attainment of this calorific value in the normal Lurgi process is due to the hydrogen constituent of the gases passing up the fuel bed and being diluted some four times with undecomposed steam, carbon dioxide and other gases. With a total pressure of 20 atmospheres the partial pressure of hydrogen is only 5. It was therefore proposed to use a deeper



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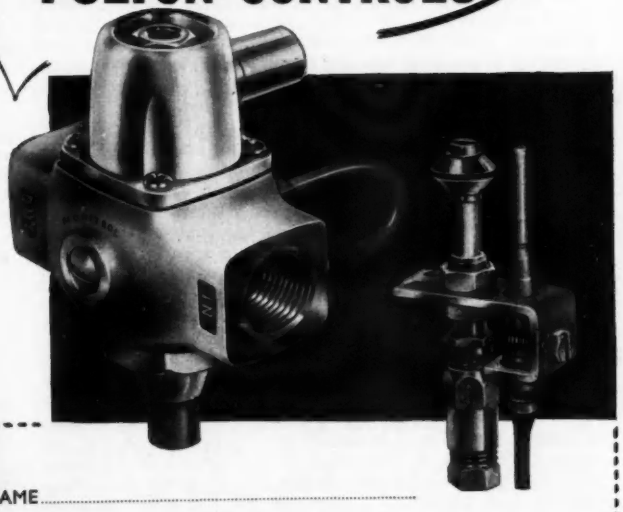

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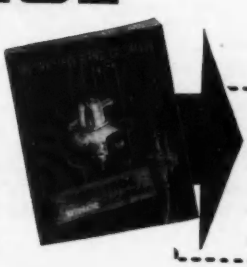

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fuel bed so that the gases could be withdrawn from an intermediate level. The undecomposed steam and carbon dioxide could then be removed before they were returned to treat the coal in the upper layers.

This procedure is to be examined on the pilot plant scale.

Further developments of the hydrogenation reaction are in progress, but it is realised that the need for a process in Great Britain solely on the grounds of it being able to gasify coal dust is not of the utmost urgency, so for the immediate future the ability of the Lurgi process to deal with run of mine coal will probably be adequate. The important requirement at the moment is to lower the cost of gas production and the most promising method appears to be to introduce the full benefits of the hydrogenation reaction.

To overcome the principal thermal loss in the present process of pressure gasification due to the use of excess process steam to prevent clinker formation, resort to slagging operation has been made and a pilot fixed bed generator, constructed by Lurgi, has been erected at the Midlands Research Station of the Gas Council to study the problems associated with slagging in pressure processes.

As the thermal efficiency of town gas manufacture by gasification methods is improved, the synthesis of liquid products as a further process may be considered. The combination would be to their mutual advantage. Gas production would benefit from the volatile matter of the extra coal used for synthesis as well as a greater reserve of gas-making capacity and synthesis would gain from there being outlets for both reaction heat and tail gases. The synthesis product could be used for chemical manufacture and ultimately to supplement natural oil, or for peak load gas production. As it is of an aliphatic nature and free from sulphur only the minimum of plant would be needed for its gasification.

Underground storage may be the best solution of the peak load problem but, if suitable rock formations are absent, there are two other solutions. One is to develop coal-using processes specially suitable for peak load operation as the plant costs are as low as possible although they may entail some loss in gas quality. The other is to reserve or prepare for peak loads a raw material more readily gasified than coal, *e.g.*, liquid methane, oil products and, particularly the lighter fractions of oil, or even the synthesis product.

Summer Meeting of the

Association Technique de l'Industrie du Gaz en France

ABSTRACTS OF SOME OF THE PAPERS PRESENTED FOR DISCUSSION

(Continued from last week)

8. Treatment of Gas for Distribution

SIX papers were submitted relating to the reconditioning of gas received from outside sources for town distribution. For example, in the Eastern Division, to which the paper by M. J. Tonnellier refers, gas received from the arterial system of that Division for distribution in the towns of the Marne is completely dehydrated and debenzolised. The mains and services in these towns are generally old and contain joints of all types. 'Conditioning' of the gas was necessary to prevent or retard deterioration of the joints. And experience had shown that the presence of some moisture in the gas was of great assistance in obviating deposits of dust.

At Evreux and Louviers gas is taken from the coke ovens of Grand-Quevilly. M. Courbebaisse describes a successful system of cold rebenzolisation and of rehumidification by means of a gas-fired boiler. A somewhat similar system at Harve is described by M. J. Kohler. M. J. Quehen describes the use of electrical micro-boilers for rehumidifying dry gas received from transmission mains and shows how these can also be used for vapourising benzole for enriching the gas—the boilers were further adapted to produce complete reconditioning in the form of a benzolised steam. They could also be adapted for injecting alcohol or other similar substances to alleviate deposits of naphthalene in the winter. In larger undertakings however he prefers separate apparatus for each of these operations. M. Saulière of Havre described a small boiler for these purposes which, heated by gas or electricity, uses tin as the fluid transmitting the heat necessary for the vapourising of water.

The gas distributed in Caen is supplied, debenzolised, by the metallurgical coke ovens at Mondeville, Normandy. It is a mixture of coke oven gas and blast-furnace gas with a c.v. of 4,200 Kcal per cu. m. (440 B.Th.U. per cu.ft.). The contract of supply prescribes a minimum benzole content of 3 g. per cu. m. (130 grains per 100 cu.ft.). In practice, it is in the region of 4 g. per cu. m. For distribution it is necessary to increase this to 12 g. per cu. m. (530 grains per 100 cu.ft.) to avoid destruction of rubber joints in the system. The problem therefore is to inject about 8 g. per cu. m. (350 grains per 100 cu.ft.) of benzole into the gas. The injection is made at outlet gasholder and the apparatus consists of a pump, an atomising injector and a heating tube. An interesting detail is that, as benzole is not auto-lubricating, it was necessary to incorporate 5% of lubricating oil in the benzole to ensure the lubrication of the pump and of the diesel motor by which it is actuated. The feed of benzole is automatically adjusted to the volume of gas passing.

In the eastern region, three installations have been set up (that at Rheims is fully described) based upon the principle that the saturation point of a vapour in a gas is constant for a given temperature and pressure. If the additives are in liquid form it is necessary to add the heat necessary for vapourisation; if it is water it is necessary to add it in the form of steam and in excess. With regard to benzole, the heat of vapourisation is supplied from the outside in just the quantity necessary, the adjustment of which is one of the means of regulating the benzole content of the gas. The apparatus is described but only outside views of it are presented. The gas is washed in a specially equipped cylindrical vessel with means to heat the gas and to vapourise the benzole, heat being supplied through steam-heated coils. The body of the cylinder and an annular space are packed with Raschig rings. This apparatus also can be used to introduce alcohol in the gas stream in winter. The theory is set out and results of test and control are given.

The six papers were taken together and provoked what the President described as a 'long and passionate discussion.'

Cold Weather Protection

An allied subject is the protection of the Parisian distribution system during cold weather by the injection of alcohol, discussed in a paper presented by Messrs. Groffier and Hutellier of the Paris group. They report investigations into the efficiency of this method in preventing the formation of ice in the services. Successive tests established the necessary doses of alcohol to be injected. The apparatus has been progressively simplified to an equipment of motor-pumps injecting alcohol at a pressure of about five atmospheres.

Results obtained in Paris in the severe February weather of 1956 on the Left Bank of the Seine and on one sector of the

Right Bank confirmed the efficiency of the method. Control apparatus is described and illustrated.

9. Distribution at Medium Pressure

M. Jean Henry, Manager of the sub-division of Tarbes (Haute Pyrenées) describes a distribution system installed to feed a housing estate adjoining that town. The gas was taken from the arterial main carrying natural gas at medium pressure from Tarbes to Bagnères. The cost of low pressure distribution in cast-iron was considered to be uneconomic. It was decided to distribute at about 3 kg. per sq. cm. (say, 3 atmospheres) in a feeder main of steel with branches and services in copper, the two metals being electrically insulated from one another. Pressure is reduced by a governor with safety devices to each consumer.

The steel main over 1,000 metres long is 40 mm. internal diameter, 3 mm. thick, protected inside by linseed oil and outside by 'carbolaque' covered with asphalt, glass wool and 'carboplast,' the latter guaranteed to resist on test an electric potential of 10,000 V. It is estimated that the system cost about one-third of what it would have done in the usual cast-iron at low pressure. Details are given of the joints and equipment.

10. Gas in Poland

Long distance transmission of coke oven and natural gas plays a very important part in the gas economy of Poland, where 76% of the total quantity at the disposal of the gas industry is piped over long distances. Of coke oven gas 86.2% was used for industrial purposes in 1955, the remainder as town gas, while the figures for natural gas were 72.2% and 25.7% respectively. The two types of gas are distributed over two separate systems. In the natural gas system peak loads are met to some extent by augmentation of extraction but this is supplemented by methane obtained by the de-gassing of coal seams, amounting to about 5% of the total quantity of natural gas, or by withdrawal from the underground storage described in another paper.

M. Adam Epsztein remarks that in spite of the fact that the part played by the gasworks is decreasing, the absolute figure for manufactured gas has almost doubled. With regard to coke oven gas, the essential problems are those of the utilisation of surplus gas during the summer, at week-ends and holidays, and the satisfaction of peak loads in winter. During the summer a part of this surplus is directed to 'balance-clients,' with heating plant of big industrial establishments and foundries with alternative gas producer plant. The balancing of consumption and supply is governed by strict regulations enforced by a Government Inspectorate; breaches of the regulations or flagrant default in the observation of recommendations may be met by penalties imposed by the Inspectorate.

11. Producer v. Coal-Gas for Industrial Heating

M. Jean Gérard, Engineer to the Commercial Direction of Gaz de France, contributed a study of the relative positions of low grade and rich gases used in industrial thermal equipment. General information on this problem of 'equivalency' is not lacking, but they are either partial or too general and do not usually permit the establishment, simply and with sufficient accuracy, of the relation between the two methods of heating, whether from the technical or the economic point of view.

The paper sets out the fundamental elements of appreciation of the efficiency of producers and the comparative characteristics of utilisation of producer gas and the rich gases. And results in practice are given which illustrate and verify the theoretical estimations.

Thermal efficiencies were determined of three producer installations of comparable capacity, feeding tunnel kilns in the ceramic industry. Three fuels were used: Gas coke, 'carbolux' and Sarre coal. The efficiencies were 81.7%, 76.0% and 73.5% respectively. Two sets of ceramic ovens designed for the use of town gas, also of comparable capacity, were studied, fired alternately by coal gas and producer gas. The comparison of thermal efficiency is in favour of town gas. The case most favourable to the use of producer gas is that of installations of high thermal capacity, using high temperatures with full recuperation.

12. Interchangeability of Gases

In a long and detailed paper M. Delbourg, in collaboration with M. Henri Schneck, describes improvements and elaborations of his method of testing and determining whether gases of compositions different from that of standard town gas can be used in the same appliances without structural modification.

The new well-known Delbourg test burner, called G.D.F. (Gaz de France), has been improved and designed for factory construction by two companies, Les Ateliers d'Appareils de Mesures et de Laboratoire (ADAMEL) and La Sté. Industrielle pour l'Exploitation de Robinetteries Speciales (S.I.E.R.S.). The two models differ from one another only in the 'technical realisation.' They are described with drawings and photographs. In short, the laboratory equipment has been replaced by portable instruments.

In the second part of the paper conclusions are given after the examination of 250 mixtures of gases with very different compositions covering the two 'families' of gas—town gas and natural gas. It was this study which led to an improvement in the method first announced in 1951, in order to render it more universal and of more precise application, taking account of all the principal elements of the composition. In particular, the influence of each of the higher hydrocarbons has been examined in detail.

In the last part of the paper it is shown how the results given by the control burner can be placed direct on the Delbourg diagram of interchangeability. The construction of an instrument is contemplated which will place automatically the representative point of the gas on the diagram, registering separately the two indices of interchangeability and lending itself to operations of control and regulation of the mixture of gases.

REVISED BRITISH STANDARD

THE British Standards Institution announces the publication of a revision of the definitions of heat insulating terms and methods of determining thermal conductivity (B.S. 874: 1956).

Part I of B.S. 874 contains definitions of heat insulating terms and a summarised list of relevant symbols and dimensions of units. The measurement of thermal conductivity and emissivity is described in Part II, including methods used for different types of materials for various temperature ranges. Conversion tables for units in common use are provided in the appendices.

One of the changes made is the adoption of the joule as the fundamental unit of heat in accordance with B.S. 350: 1940, amendment No. 4, October, 1953 (P.D. 1715), which also defines the corresponding values for the revised steam table British thermal unit and the revised steam table calorie. The effect of this change on heat insulation calculations is negligible.

B.S. 874 may be obtained through the Sales Branch of the British Standards Institution, 2, Park Street, London, W.1. Price 5s.

CO-ORDINATION—from p. 628.

A great deal of work is being done at the present time by all the fuel industries to ensure that the advancement in fuel research is being carried on as far as resources will permit. In fact, there are 17 main agencies which are engaged in some form of fuel research in this country. These include the National Coal Board, the Central Electricity Authority, the Gas Council, the oil companies and the Ministry of Fuel and Power. The Institution of Gas Engineers, too, is examining the possibilities of complete gasification, the occurrence of natural gas and the increased production of smokeless fuel. The oil companies on a more international scale are engaged in research into the use of Middle East crudes with a lower sulphur content, the combination of diesel engine efficiency with the lower compression ratio of the petrol engine by the retention of some of the sensible heat in the exhaust gases, and in close collaboration with the Gas Council, the possibility of the gasification of heavy oils with a variable calorific value. The National Coal Board is trying to find the most economic means of winning of coal by the increased mechanisation in the mines, and the use of hydraulic power for the transportation of coal, especially underground. The C.E.A. are striving to increase the efficiencies of their generating stations.

EUROPEAN DOMESTIC FUEL CONSUMPTION

From a document prepared by the Secretariat of the Economic Commission for Europe

DETERIORATION in the quality of coal in post-war years, due to increased mechanisation of the mines and to exhaustion of the better seams, coupled with insufficient output of anthracite and other typical domestic coals, is a serious drawback which largely explains the consumer's preference for other forms of energy. Moreover, solid fuels suffer from inherent disadvantages such as, for instance, dirtiness and the need for cinder removal, apart from the fact that, when burnt in the old-fashioned grate, they add to atmospheric pollution. The remedial steps now being taken by certain countries might be of interest to others in the development of appropriate policies.

Improvements in Fuel Quality

In France, where the key problem is to substitute high-volatile bituminous coals for anthracite and lean coals, which are in short supply, emphasis is being placed on the preparation of manufactured fuel of reduced volatile-matter content. In Western Germany, where lean coals of a relatively high caking property are in freer supply than the more traditional domestic coals, efforts are being made to produce from the lean coals ovoids that will not emit smoke or cake in stoves. Belgian coal producers are developing the manufacture of small ovoids of low ash content, especially those of 20 g, and are also studying ways of using gras coals. In Poland also efforts are being made to reduce the inert-matter content of fuels; coal deliveries in general have an ash content of 5 to 8% and in any case less than 10%.

The central problem in the United Kingdom, with the likely introduction of measures to ensure cleaner air, is to transfer from bituminous coal to smokeless fuel-burning in improved appliances wherever possible, as well as to continue with the development and installation of appliances capable of burning bituminous coal as efficiently and smokelessly as possible. The additional requirements of domestic smokeless fuel are likely to be met in the first instance by encouraging the diversion of coke from certain non-domestic consumers.

Coke has not generally been a popular domestic fuel in the United Kingdom, as it is difficult to ignite it and to maintain a small fire of bright, attractive appearance, but it is probable that, preferably improved in quality and sizing, it will be the main substitute for bituminous coal in open fires. Experimental work has been started in an attempt to produce a coke having a more combustible quality than the normal gas coke: Selected weakly coking coals have been carbonised and the results so far obtained are promising. Research work is also in hand on the problem of how to agglomerate small or powdered coal into suitable sizes, render the briquettes smokeless and, at the same time, produce a fuel attractive to the householder from the point of view of adequate strength, easy ignition and giving a cheerful glow.

In other countries as well as the United Kingdom efforts are being made to produce at competitive prices synthetic fuels such as carbolux, l'Anthracine '54, synthracite and coalite, all of which are of high calorific value and low ash content.

A method for suppressing the dust that is normally unavoidable in the use of coal has recently been developed in Belgium and may be well worth investigating in other countries. This consists in sprinkling the coal with calcium chloride. The sale of coal in paper bags or in jerry-cans is also becoming more common. In large towns of Western Germany, for instance, experiments are being made in the delivery of paper bags containing 15 kg. of ovoids; the bags, which are filled at the mine, can be placed directly into the stove. In France, in Paris and Lyons, 'charbons services' deliver jerry-cans of coal, tightly packed to avoid dust, which can be poured directly into the stove. The jerry-cans can be stacked conveniently, and some suppliers also remove ashes.

Appliances

Appliances burning smaller sized coals with high efficiency, unlike those burning large coals, can be constructed for automatic control. Coal producers, especially in Belgium, France and the United Kingdom, are making considerable efforts to develop these. The Charbonnages de France have a department which studies new equipment and supplies constructors with technical aid and financial help in the form of long term loans. A special effort is to be made this year, when new designs are to be put on the market.

The authorities in several countries issue periodic lists of recommended appliances, but some degree of standardisation of appliances or the main parts of them would help to reduce costs. The elimination of many of those listed would also be helpful.

Technical and Advisory Services

It is frequently suggested that some of the growing resistance to coal burning in Continental households could be overcome by providing technical and advisory services on the scale undertaken by oil distributors, by extending contract heating, and by the practice of delivering packaged coal and arranging ash removal on a regular basis, referred to above. But a major obstacle is inherent in the structure of the coal trade which in many countries is composed at the consumers' end of a large number of retailers handling very small quantities. In Belgium, for instance, there are some 15,000 retailers handling about 7 mill. tons a year, or an average of less than 500 tons each. In western Europe as a whole there are some 80,000 merchants. Governments, as well as the trade, are aware of this and in recent years they have made great efforts by legislative and other means to promote the efficient use of fuel. One of the most interesting new developments is the establishment in France of the 'Société de Contrôle et de Documentation pour l'Utilisation des combustibles' (SCEDUC).

In Western Germany the industrial norms (DIN) are established by normalisation committees and published by the 'Deutschen Normenausschuss' and given a DIN label which, though not compulsory, is regarded as being of importance.

In the United Kingdom, the Ministry of Fuel and Power has statutory responsibility under the Act of 1945 for promoting efficiency in the use and consumption of fuel.

Until very recently Belgium seems to have lagged behind most other countries in the provision of technical and advisory services to domestic consumers, but the large accumulations of unsold coal at the mines during 1953 and 1954, coupled with increasing penetration by oil into the domestic market, clearly proved the necessity for continuous and co-ordinated action. In 1953 the coal trade set up the 'Association pour l'Utilisation Rationnelle des Combustibles' (AURACO), which undertakes propaganda work and supplies information.

TRADE NEWS SUPPLEMENT

STAFFA BARGE CRANE

THE 'Staffa' barge crane is the latest addition to the Chamberlain Industries Ltd., range of mobile and shop cranes.

Originally designed and built to the requirements of Eccles Transport (Rivercraft) Ltd., for handling stone and slag in connection with river bank consolidation work on the Trent and Humber, the 'Staffa' hydraulically operated barge crane is of light-weight construction and is designed to be installed in a well in the bow of the barge so that both cargo and crane can be covered over for protection from the weather.

The specially long jib permits the whole of the barge to be unloaded and is also advantageous where there is insufficient depth of water near the river bank to permit close mooring of the barge.

Specification

The crane consists of a 30 ft. cantilever lattice type jib, pivoted on an 'A' frame, which in turn is mounted on a machinery base.

The superstructure mounted on the machinery base is constructed from rolled steel sections and steel plate and carries a Ford 4-cylinder diesel engine directly coupled to a Plessey pump with a capacity of 24 gal. per minute.

The jib is hydraulically derricked by means of a hydraulic ram fitted to the tail shaft of the jib. A hydraulic motor with a steel pinion gear integral with an internal spur ring provides a rotary movement.

The capacity of the crane is 10 cwt. at 30 ft. radius with lifting speeds up to 150 ft. per minute, derricking speeds from 12/30 ft. radius in 17 seconds and a slewing speed of 4 r.p.m.

The illustration shows the crane before installation in the barge with free standing counter weights securing the temporary base.—*Chamberlain Industries, Ltd., Staffa Works, Staffa Road, Leyton, London, E.10.*

British Oxygen at the Motor Shows

THE British Oxygen stand at the Commercial Motor Transport Exhibition (September 21-29) and also at the Motor Show (October 17 to 27), will be devoted exclusively to a completely new range of oxy-acetylene hand welding and cutting blowpipes which are being exhibited for the first time.

The equipment, marketed under the name Saffire, is available in three basic forms—a universal cutter, a welding blowpipe, and a combined welding and cutting outfit (the latter is illustrated below).

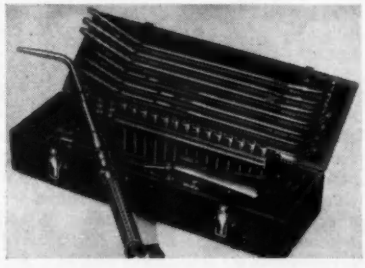
The Universal cutter sets a new standard in safety and efficiency for gas cutting blowpipes. The design embodies the nozzle mixing principle which greatly reduces the chance of backfire, thereby increasing the safety factor. It will cut steel up to 12 in. thick and cast iron up to 3 in. thick. It is available with heads of varying angles (90°, 75° and 180°). A Saffire heavy cutter with 75° angle head is also available for cutting thicknesses of mild steel from 12 in. up to 20 in., and cast iron up to 18 in. thick.

All Classes of Welding

The basic Saffire welding blowpipe consists of a shank and mixer, together with a wide range of newly-developed swaged copper tips for all classes of welding. Alternatively, the shank and mixer is available with long and short bent necks to which conventional detachable nozzles may be fitted in a wide range of sizes.

The combined outfit is supplied with all the necessary fittings to enable the equipment to be used either as a cutter or welding blowpipe and is available in a stout carrying case, if required. It is available in three basic types—as a general engineers' set, motor engineers' set and agricultural set.

A unique feature of the Saffire range of equipment is that once the customer has a shank and mixer he can purchase any of a wide range of nozzles, as necessary, and even convert his welding blowpipe into a hand cutter, if required. Also available are attachments for other uses, such as flame cleaning, and heating.—*British Oxygen Co., Ltd., Bridgewater House, St. James', London, S.W.1.*



BRAY LOADING SHOVEL

A MAJOR contribution towards reduced handling costs is made by a new hydraulic loading shovel introduced by W. E. Bray and Co. Ltd. To be known as the Hydraloader 20 it has been designed to play an important part in meeting the challenge and the need for drastic economies in British industry.

At a lower price and with improved specifications this latest shovel in the well known Hydraloader series represents a positive effort to combat spiralling prices, to save capital outlay and to respond to Government requests for an all-out effort on the part of British manufacturers.

The Hydraloader 20 is a power crowd shovel with a standard ¾ cu. yd. bucket and a safe working load of 1 ton. It has all the ability and versatility of its predecessors, incorporates the latest Bray hydraulics and is yet offered at a lower price. In the fundamentals of Bray loading principles there has been no economy.

Attachments

A 'dozer blade, a snowplough, crane, fork lift and hoist attachments are all available for the Hydraloader 20 and are easily interchangeable. The same features that provide positive control of the bucket are utilised in the operation of these attachments and in this connection a parallel linkage of the main and crowd booms is particularly advantageous when the fork lift or hoist is being employed. The attachment is maintained at the same level to the ground at any height.

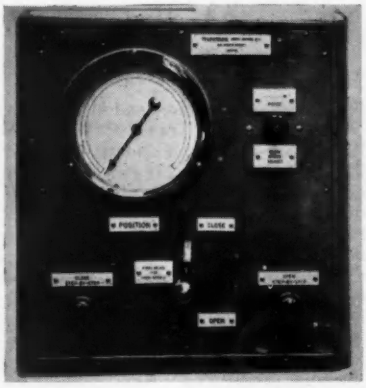
The power unit is a Ford diesel developing 42 b.h.p. at 1,750 r.p.m. with a speed range of 1.86 m.p.h. to 11.8 m.p.h. (13.2 m.p.h. with 14.00 rear tyres replacing the standard 12.00). The mainframe and booms of the Hydraloader 20 are constructed from box-sectioned steel for adequate reserves of strength.—*W. E. Bray and Co., Ltd., Feltham, Middlesex.*

New Developments in Pneumatic Remote Control for Valves

THE standard motorising units supplied by Telektron (Great Britain), Ltd., are meeting many and varied marine and industrial demands for the remote control of all types of standard valves. These motorising units can be fitted to valves *in situ*—and amongst their many unusual features are extreme simplicity and suitability for incorporation into both simple and complex control systems.

The equipment is suitable for operation from 3-15 p.s.i. control signals and is proving especially suitable for group process valve control.

A recent and important development in valve control has been the design of a small compact control panel which provides the operator with the same flexibility and sensitivity of valve adjustment as can be achieved by manual control of the valve handwheel. The panel illustrated provides valve adjustment at both high and low speed together with step-by-step movement and position indication.



High or Low Speed

The simple standard motorising unit is fitted to the valve and connected to this control from one or more of these panels arranged in parallel or with a master and secondary panels. The lever type control provides high or low speed operation in either direction, the low speed being adjustable by the operator on the panel face.

The push buttons provide step-by-step adjustment in 36, 58, 76 or 100 positive steps per revolution of the valve handwheel. For each push of the button one step only is taken however long the button is depressed.

A small stainless steel transmitter unit fitted to the valve provides mechanical position there and transmits it pneumatically to the control station or stations by a single small bore pipe where it is indicated on edgewise or dial type indicators. An important feature of this position indicator is that its accuracy is unaffected by variations in the air supply pressure.

An unusual feature of the control panel is the special dual purpose lever control switch which has a spring loaded head, the depression of which in the operational position alters the speed from the adjustable slow speed to full speed.

This switch has many other uses in connection with the Telektron motorising units and frequently used to provide a single control for interlocked normal or step-by-step operation.

For this application movement of the lever in either direction produces a single step, unless the head is depressed in the neutral 'off' position when movement of the lever in either direction sets the motorising unit into normal continuous operation. As the head must be depressed from the neutral position it prevents any danger of accidentally putting the unit into normal operation when a single step adjustment is required.

Another and interesting control arrangement designed by this Company is for open/close valve control with end point indication and assurance of tight closure from a control panel comprising only two push buttons, one for each direction of travel. When either push button is pressed the head remains depressed until the valve has stalled against its seat which causes the button to fly out again cutting off the air supply and indicating that the end position has been reached.

Important Feature

An important feature of the Telektron motorising and position indication equipment is the very low air consumption, less than 3 cu.ft. of free air per minute for the single motors and a tenth of a cu.ft. for the position indication equipment, enabling a very small emergency air supply cylinder to be used to provide sufficient air storage for valve operation and position indication after power and compressor failure.

Arrangements are often made to provide for automatic valve movement to the safe position in the event of such failure. In addition manual control is always available at the valve unless the motorising equipment is in operation, without the complication of clutch or other mechanism. — *Telektron (Great Britain), Ltd., Eagle House, 109, Jermyn Street, London, S.W.1.*

Epping Auto-Shunters

F. E. WEATHERILL, LTD., well known as manufacturers of mobile loading shovels under the name of 'Weatherill Hydraulic,' announce that the British Transport Commission have recently placed an order with them for 13 Epping auto-shunters for British Railways. The Port of London Authority have also placed a repeat order with them for four shunting tractors.—*F. E. Weatherill, Ltd., Tewin Road, Welwyn Garden City.*

PUBLICATIONS RECEIVED

Grabs and Conveyors

Two publications by G. Hunter (London), Ltd., have recently been received. They are *Mansaver Grabs* and *Conveyors.* Mansaver industries was started in 1923 by a crane engineer who suddenly realised that the ratio of 'hook on' time to the time consumed in actual hoisting and moving was quite large. This engineer began developing special devices so that from a single grab in 1923 more than 500 different styles are serving almost every industry. These grabs are semi-automatic, fully automatic, manual, motor or hydraulically driven.

Mansaver grabs make it possible for older men to continue handling tasks in which they have developed skills and knowledge of plant operations. Brawn is no longer the key; Mansaver grabs can do what no man can do. Although there are a limited number of so-called standard grabs, most Mansaver grabs are supplied to meet particular requirements.

The two booklets describe some of more than 500 different styles Mansaver has already built, ranging in capacities from 5 lb. to 100,000 lb., and the Company's very wide range of gravity roller, slab, belt, and overhead conveyors.—*G. Hunter (London), Ltd., 80, Fenchurch Street, London, E.C.3.*

Safety Goggles

For over 50 years the house of Fleming has pioneered the development and manufacture of products to aid and protect vision. Users of Fleming safety goggles know that the experience and knowledge gained, and the high reputation built up during this long period, is an assurance that every article offered is among the best of its kind, and can be relied upon to give both protection and comfort to the wearer.

While it is impossible to illustrate every pattern in the wide range available the Company has produced a new catalogue providing a comprehensive selection which should be invaluable to all requiring a means of protecting the eyes.—*Fleming Safety Goggles (Division of J. & R. Fleming, Ltd.), P.O. Box 110, 146, Clerkenwell Road, London, E.C.1.*

Rotarprest Ends

In their new brochure, G. A. Harvey & Co. (London), Ltd., have collated complete technical information relative to the ends they are able to produce, together with particular reference to the wide range of die-pressed dished and flanged ends normally available from stock. This brochure will prove of interest to many branches of industry.—*G. A. Harvey & Co. (London), Ltd., Greenwich Metal Works, London, S.E.7.*

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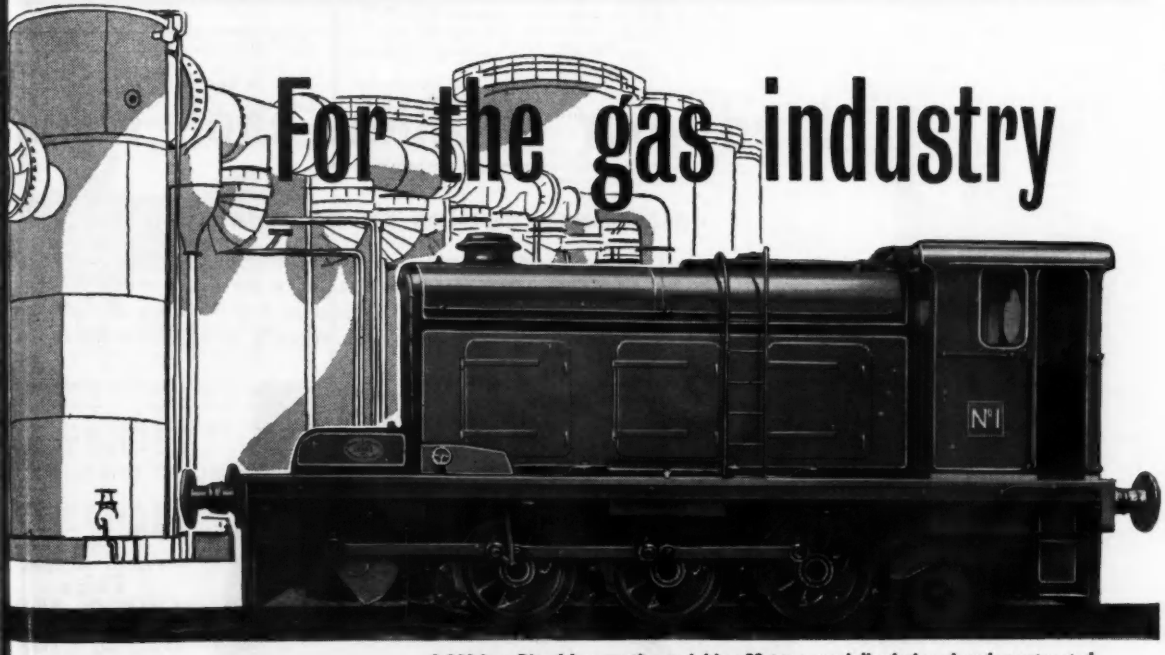

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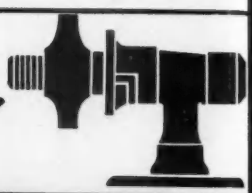
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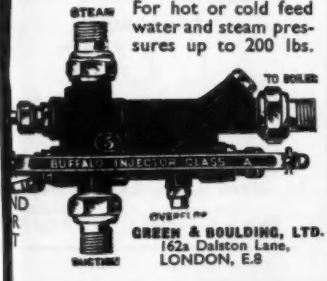

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Applications should be made on the official form obtainable by writing to the Chief Personnel Officer, N.W.G.B., Liverpool Group, Radiant House, Bold Street, Liverpool, and returned to him within 14 days.

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NEWTON ON AYR DISTRICT
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APPLICATIONS are invited for the post of Senior Technical Assistant in the Newton on Ayr District Undertaking.

Applicants should possess the Higher Grade Certificate of the Institution of Gas Engineers, or an equivalent qualification, and should have experience in the operation, maintenance and layout of Gas Works Plant and Distribution Systems. A knowledge of the operation of Continuous Vertical Retorts and Carburetted Water Gas Plant is desirable.

The salary applicable to the post will be within A.P.T. Grade 7 (£670 to £750) of the National Salary Scales for Gas Staffs.

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A house is available at a reasonable rental.

Applications, stating age, and giving particulars of education, training, experience, and qualifications together with the names of two referees, should be addressed to the undersigned to arrive not later than September 28, 1956.

C. E. N. FRESHNEY,
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(*Classified advertisements continued on page* 644)

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Candidates should hold the Higher Grade Certificate in Manufacture of the Institution of Gas Engineers. They should possess practical experience of the operation of vertical retort plants and normal ancillary plant and should be experienced in all routine gasworks tests.

The salary will be within A.P.T. Grade 5 (£575-£655 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with the names of two referees, should be adressed to Mr. J. E. Stanier, Divisional General Manager, Etruria Gas Works, Stoke-on-Trent, to reach him not later than September 24, 1956.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

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INDUSTRIAL GAS REPRESENTATIVE

APPLICATIONS are invited for the above position. Candidates should have experience in industrial and commercial gas utilisation and a knowledge of the comparative costs and merits of other fuels.

Possession of the Institution of Gas Engineers Higher Grade Certificate in Gas Engineering (Supply) or equivalent qualification would be advantageous.

The salary will be within A.P.T. Grade 8 (£710-£790 per annum) of the National Salary Scales.

The post is pensionable and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with names of two referees, should be addressed to Mr. J. E. Stanier, Divisional General Manager, West Midlands Gas Board, Etruria Gas Works, Stoke-on-Trent, to reach him not later than September 24, 1956.

J. C. INGRAM
Secretary to the Board.

SOUTH EASTERN GAS BOARD

HOME SERVICE ADVISER
EAST SUSSEX
SUSSEX DIVISION

SUCCESSFUL applicant will be centred at Hastings and will be required to conduct demonstrations, give lectures and advise consumers in their own homes in the use and care of gas equipment.

Preference will be given to applications from persons who:—

(a) have had not less than 3 years' experience in demonstration in Gas Industry; and
(b) have undergone training for 2 years at a recognised training college of Domestic Arts; and
(c) hold a diploma in cookery, housewifery and laundry work.

Salary within range £475-£568 per annum according to qualifications and experience.

Applications in writing, quoting reference V10/720 and giving full details, should reach the undersigned not later than seven days after the publication of this notice.

R. J. MCCRAE,
Personnel Manager.

Katharine Street,
Croydon.

WALES GAS BOARD

CARDIFF UNDERTAKING
ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above-mentioned position at the Grangetown Gasworks of the Cardiff Undertaking.

Candidates should possess the National Certificate in Mechanical Engineering, or equivalent qualification, and preference will be given to those having experience in the Gas Industry.

The successful candidate will be required to undergo a medical examination and to subscribe to the Board's Superannuation Scheme.

The salary will be within Grade A.P.T. 8 Provincial 'A' (£710-£790 per annum) of the scales agreed by the National Joint Council for Gas Staffs.

Housing accommodation will be available at a reasonable rental.

Applications stating full personal particulars and experience, giving the names of two referees, should be addressed to the Undersigned and posted so as to arrive within 14 days of the appearance of this advertisement.

J. POWDRILL,
General Manager & Engineer.

Gas Offices,
Bute Terrace,
Cardiff.

SOUTHERN GAS BOARD

CUSTOMER ACCOUNTING SUPERINTENDENT

APPLICATIONS are invited for the new post of CUSTOMER ACCOUNTING SUPERINTENDENT.

The job will be based on Southampton and the successful applicant will be responsible to the Chief Accountant.

A wide experience of large-scale organisation in this field is essential.

The salary will be on Senior Staff Scale, Grade E, £1,525-£1,725, or by arrangement with the successful applicant.

All applications must be on the Board's standard form, obtainable from the Personnel Manager, 164, Above Bar, Southampton, and should be returned to him not later than Monday, September 24, 1956.

P. VALON BENNETT,
Personnel Manager.

September 7, 1956.

SOUTHERN GAS BOARD

ASSISTANT MEDICAL OFFICER

APPLICATIONS are invited for the new and sionable post of whole-time ASSISTANT M CAL OFFICER. Previous experience in Ind Medicine would be an advantage.

The salary will be on Senior Staff Scale, Gra £1,375-£1,575, or Grade E, £1,525-£1,725, arrangement with the successful applicant.

The successful candidate will be required to a medical examination and, unless already to a Pension Scheme by virtue of the Gas (P Rights) Regulations, 1950, will be required to the Board's Staff Pension Scheme.

All applications must be made on a form may be obtained from the Personnel Manager, ern Gas Board, 164, Above Bar, Southan pton completed forms should be returned by M October 22, 1956.

P. VALON BENNETT,
Personnel Manager.

September 7, 1956.

EAST MIDLANDS GAS BOARD

LEICESTER AND NORTHANTS DIVISI
LOCAL SUPERINTENDENT—MARKET HARBOROUGH (LEICESTERSHIRE)

APPLICATIONS are invited from suitably q persons for the position of LOCAL S INTENDENT, Market Harborough. The appoi will be made within Grades APT. 6/7 (£610-£7 annum).

Market Harborough is a non-manufacturing taking, and there are approximately 3,400 con in the district. The Undertaking forms part Leicester Group, and whilst overall control i cised from Group Headquarters the Local intendent will be directly responsible for sal consumer service, and minor distribution work district.

A self-contained flat is available on reasonabl under a standard Service Occupation Agreeme the person appointed.

The post is pensionable, and the successful cant will be required to pass a medical exam

Applications stating age and giving details of tion, qualifications and experience, together w names of two referees, should be addressed t the undersigned not later than September 15

H. B. TAYLOR,
Divisional General M

Gas Offices,
Millstone Lane,
Leicester.

August, 1956.

The
LIMIT OF EFFICIENCY CAN BE REACHED
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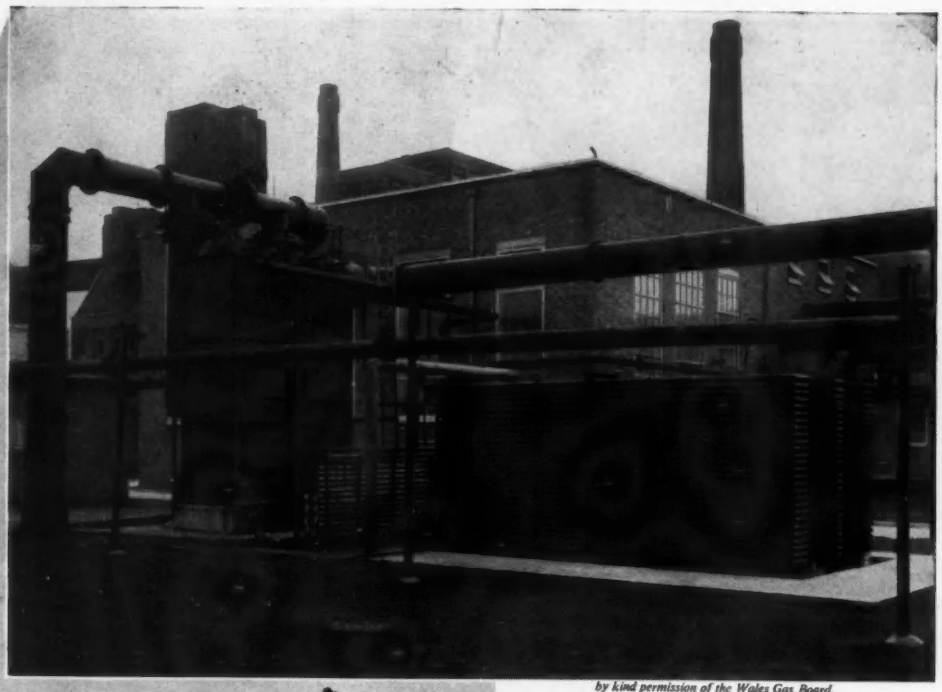

by kind permission of the Wales Gas Board.

Gas Dehydration by Holmes

Gas Dehydration Plant recently installed at Maelor Gas Works. Capacity 5,000,000 cu. ft. per day.

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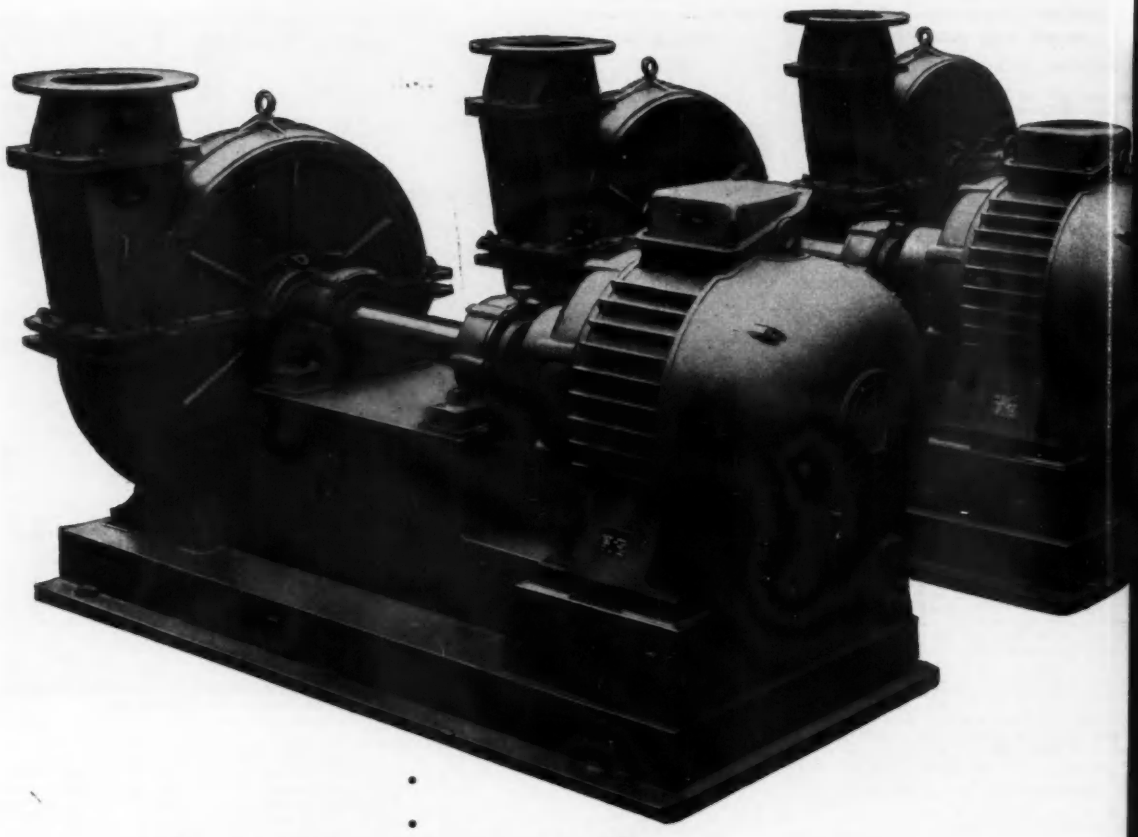

Gas Boosters?

EXAMPLES of gas boosting fans with cast iron casings illustrated here. They represent the results of special attent to the design and development of robust, trouble-free boos over the years. This experience provides fans for handl volumes of 5,000 to 1¼ million cubic feet of gas per hou pressures up to several pounds per square inch.
When the time comes you'll find there's no easier way to s your air or gas moving problem than to put it to Keith Blackm

contact **Keith Blackman Ltd**
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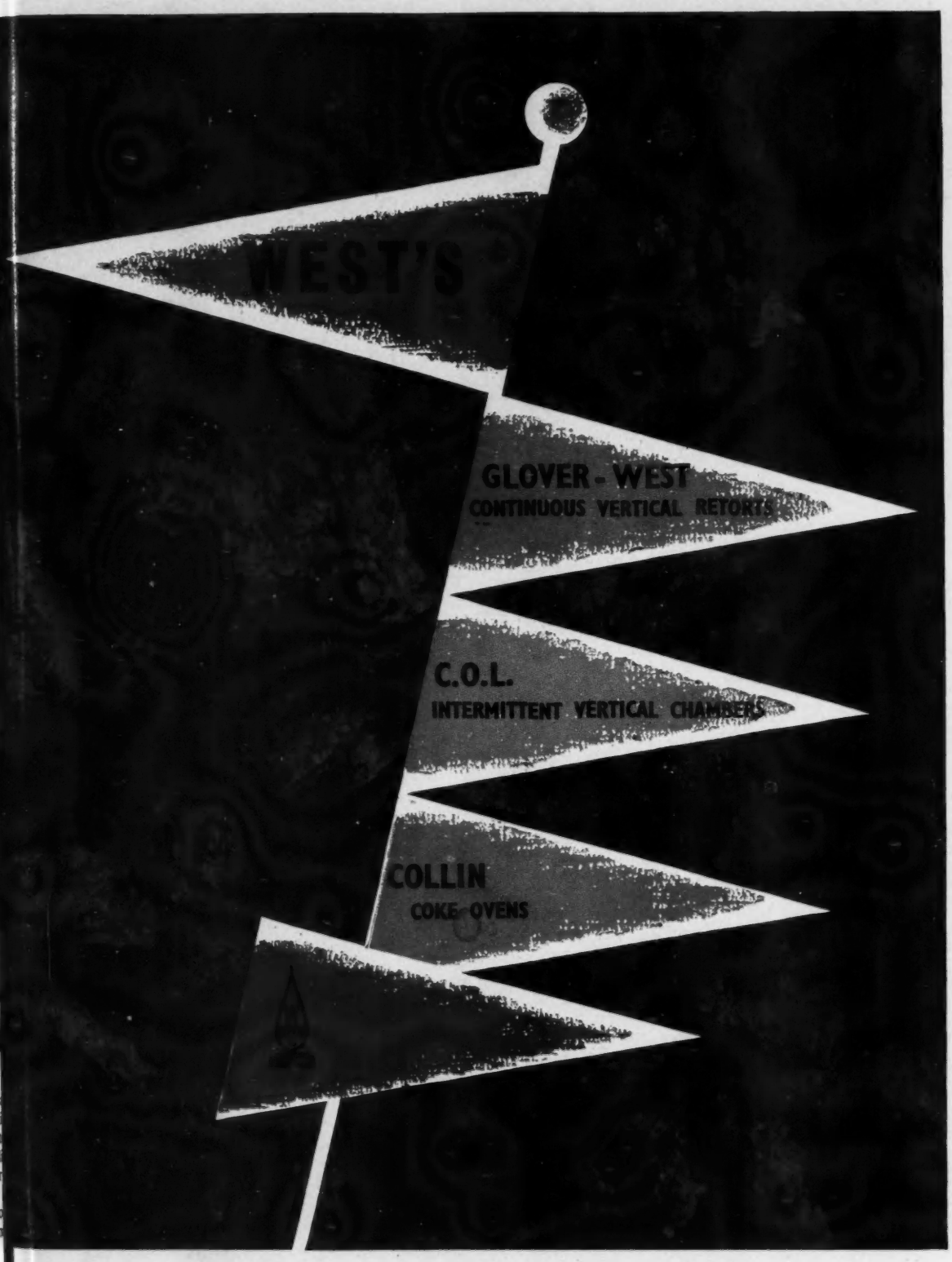


WEST'S GAS IMPROVEMENT COMPANY LIMITED

ILES PLATTING, MANCHESTER 10 TEL: COLLYHURST 2961 GRAMS: STOKER, MANCHESTER

AND IN LONDON

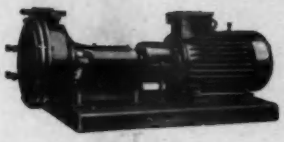
Cumbria House, Aldwych, W.C.2. Tel: HOLborn 4108 C.O.L. Div: Chandos House, Buckingham Gate, S.W.1. Tel: ABBEY 6912

C2

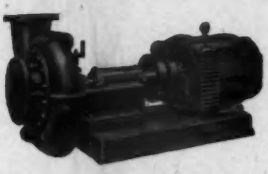
PUMPS AND FILTERS

Filtration Plant

Rotary pump for Oil transfer duties

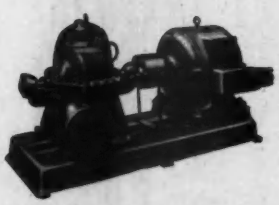


Stoneware pump for Corrosive and chemicals

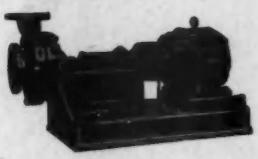


Slurry pump for coal washing and abrasive liquids.

FOR ALL GAS AND ALLIED INDUSTRIES

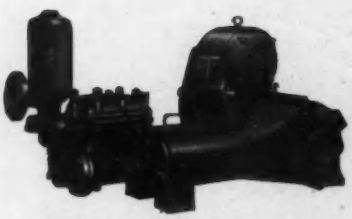


"HS" Type—for water services. All heads up to 500 feet.

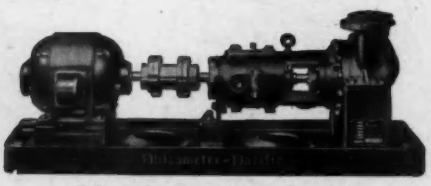


"JA" & "JB" types for high temperature water circulation.

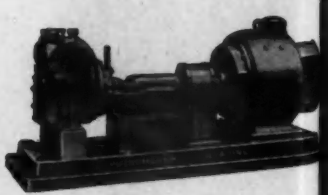
The illustrations show centrifugal pumps for light and heavy oil and liquor duties, stoneware and special metal pumps for handling acids and alkalis, pumps for circulating and washer duties, for clean water and fire services and for liquids containing abrasives.



Reciprocating pump of modern design for Gas Works.



Pulsometer—Pacific type, based on latest American practice.



Self priming centrifugal pumps.

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